

ENTOMOLOGICA AMERICANA

VOL. XII (n. s.)

JUNE, 1931

No. 1

A MONOGRAPHIC REVISION OF THE TREEHOPPERS OF THE TRIBE TELAMONINI OF NORTH AMERICA

BY E. D. BALL

UNIVERSITY, TUCSON, ARIZONA

The treehoppers (*Membracidae*) of the north temperate region largely belong to a single sub-family, the *Smiliinae*. The members of this sub-family have simple tibiae and the pronotum extending over the entire body. They may be recognized easily by reference to a single character; *the terminal cell of the elytra is petiolate*, while in the other groups it is elongate with the base truncate. The *Smiliinae* may be divided into tribes as follows:

- A. Elytra free, clavus uncoveredTribe *Cerasini* Godg.
- AA. Clavus and frequently part of corum covered by pronotum.
 - B. Underwing with the terminal cell sessile, its base truncate.
Tribe *Telamonini* Godg.
 - BB. Underwing with the terminal cell petiolate.
 - Tribes { *Smiliini* Godg.
 - { *Polyglyptini* Godg.

TRIBE *Telamonini* GODING

The members of this tribe are almost all North American and limited to the more temperate regions. Certain species are found in the arid Southwest or in the high tablelands of Mexico and a very few still farther south in the higher mountains, but only in mountainous regions where the seasons are relatively short and the

temperatures moderate. This tribe and the *Smiliini* are strictly tree inhabiting and tree feeding forms while the other two tribes are found mainly on annual or perennial herbs. The single tribe *Telamonini*—includes all but three or four of the larger tree inhabiting forms occurring in the United States.

Generations

They are, as far as known, all single brooded throughout their range, pass the winter in the egg stage, usually in the twigs, and hatch out as soon as the leaves appear and the young growth starts. The nymphs are usually the color of the young bark and are found flattened down in the crotches where they are difficult to detect. In the normal temperature conditions of Iowa and Illinois they mature in early July and the majority of the adults are gone before the end of August.

Habitat

As suggested by Funkhouser, the members of this group are lovers of the open. An isolated tree or a scattered group on a low hill furnishes an ideal habitat. They are almost never found in the shade of a woods and only sparsely along the edges of dense growths. The adults depend upon their resemblance to the bark or foliage for concealment, but when approached too closely they snap away with a speed that the eyes cannot follow. This jump is not from one limb to another but out into the open where they unfold their wings and dart away. They prefer the outer limbs from six to ten feet above ground and only those in the open.

Collecting Methods

Successful collecting of these large treehoppers requires as much skill and furnishes as many thrills as trout fishing or quail hunting. One must know the favorable locations, the proper season and the right time of day. Even with these conditions met, a keen eye and a steady hand are necessary to success. The most satisfactory collecting bottle is made from a heavy walled glass tube one inch in diameter and six or more inches in length. Having located the treehopper resting as usual on a small limb in the outer part of the head of a tree, the glass tube must be moved straight towards it with a steady hand. If the hopper is resting on the underside the tube must move straight up until it touches the limb, then a slight sidewise movement until the glass taps the head and—snap—you either have a treehopper in the bottom of your bottle or else you

do not, depending upon how dextrous you were. By using a long light stick the outer limbs may be beaten over a net and both nymphs and adults collected.

Food Plants

The treehoppers of this group are with few exceptions confined to a single species of tree in their nymphal stages and in a few instances to restricted parts of the tree. For example, nymphs taken in the crevices of the bark of the trunk of the Bur Oak usually alongside a small sprout just under the head all hatched into one species while nymphs taken on the small branches of the outer part of the head all emerged later as another species. In the adult stage the males especially are often taken from other trees, but usually only a short distance from their host. Records of accidental captures therefore should not be used as guides to food habits.

Parasitism

Dr. Kornhauser has shown that the attacks of a Dryinid (*Aphelopus theliae*) larval parasite with polyembryony, produces profound modifications of the sexual organs and of the sexual color pattern in *Thelia bimaculata* and warns against being misled by parasitized individuals. The writer has found this or a similar parasitism affecting nearly all the species of this group and frequently producing greatly modified forms.

Diagnostic Characters

The characters most frequently used in other groups of Homoptera such as venation, genitalia and head shape are of no value in this group for either generic or specific separation. As most of the early descriptions were largely based on these characters and certain dark spots above the eyes which are almost equally variable, it has been very difficult to interpret descriptions and much confusion has resulted. The males are usually much smaller and darker than the female and have smaller and less angular crests so that they have often been separated or assigned to other species thus adding to the confusion and preventing correct food plant determinations.

The entire body being covered and protected by the pronotum in the adult stage there has been little reason for variation in the body structures with the result that the variation and adaptation has practically all taken place in the pronotum itself. When one considers that this covering arises from a small structure in the

last instar nymph and must be inflated, shaped and colored according to a definite pattern in a few hours of an early morning before the sun's rays harden the chitin, the wonder is not that it is variable but that it can assume such a variety of generic and specific patterns with such unfailing accuracy. The nymphs having no protective covering are subject to adaptive modifications in shape of head, pronotum and body, in color and in the development of spines and processes. Generic characters are expressed in various types of nymphal shapes and in the different patterns of modification of the pronotum such as horns, crests, arches, etc. Specific characters are almost entirely based on size, shape and color pattern, and differences in shape of horn, crests and humeral angles within the generic patterns.

Areas in which Collections have been Made

The writer began the study of the food plants and life histories of the treehoppers at Ames, Iowa, in 1894 and continued to collect in that rich area through 1897. Colorado and Utah were later intensively collected with relatively poor results. A number of trips to California and the Northwest were more productive. Two years in Wisconsin followed by two more in Iowa gave opportunity to work out many life histories and food plant relations. Several years in Washington and vicinity with trips to New England and several days on Fitch's farm at Salem, New York, were helpful. Three seasons in Florida were interesting and productive and the last two in Arizona have rounded out a survey of the large treehoppers of the United States.

Collections and Types Studied and Acknowledgments

In the course of the work the writer has visited and studied the following collections: American Museum of Natural History (Dr. Lutz); L. L. Woodruff; Chris E. Olsen; H. G. Barber; Boston Society of Natural History, including the Harris collection (Dr. Johnson); Royal Museum, Toronto, (McDunnough); Wm. T. Davis; State Museum of New York, Albany, including the Fitch collection (Dr. E. P. Felt); Cornell University collection including the Heideman collection; W. D. Funkhouser; Carnegie Museum, (Hugo Kahl); Academy of Natural Sciences, Philadelphia, (Dr. H. Skinner); U. S. Natural Museum including the Uhler, Baker and Goding collections (Aldrich, Rohwer and Morrison); Florida State Plant Board (G. Merrill); Ohio State University; H. Osborn; D. M. DeLong; J. G. Sanders; Illinois State Laboratory of Natural

History (T. H. Frison); Wisconsin University (Dr. Wm. Marshall); Prof. Wescott; University of Minnesota (C. H. Mickle); Iowa State College including the Van Duzee collection (Dr. Drake); Dr. H. H. Knight; University of Nebraska (Lawrence Bruner); University of Kansas (Dr. P. R. Lawson); Kansas Agricultural College (Prof. G. A. Dean); Colorado Agricultural College (C. P. Gillette); G. M. McElfresh and the California Academy of Sciences (E. P. Van Duzee).

To all of these institutions and individuals whose cooperation and assistance has been so generously given, grateful acknowledgment is made. Mr. W. E. China of the British Museum has kindly compared material and made many helpful drawings of types. Mrs. F. W. Streets has, as indicated, prepared and arranged the illustrations.

Synonymy and Bibliography

The Van Duzee Catalogue of 1914 and the Funkhouser Catalogue of 1926 give sufficient information so that no bibliography is appended and only primary synonymy is given except in cases where it is necessary to correct previous errors of reference in synoptic works. The genus *Telamonanthe* Baker has been omitted as it possesses the petiolate cell in the underwing and belongs in the tribe *Smilini* as described and not in *Telamonini* as placed in the Van Duzee and Funkhouser catalogues. On the other hand the genus *Tropidarnis* Fowler which was described as a Darnid is evidently a *Telamonini* and has been included. Every described species has been restudied. Of the 109 names considered, 13 have been transferred to other groups and the remaining 96 referred to 52 species and 3 varieties. Two species and 10 varieties have been added making a total of 54 species and 13 varieties, or 67 forms, discussed.

A critical consideration of the earlier descriptions and types has inevitably resulted in some startling changes in nomenclature but the writer is fairly confident that the oldest names have been correctly placed and that the present treatment will bring about specific stability.

Types of New Species and Varieties

The writer published in 1925 the new species discovered in the first draft of this work. The types of the two new species and ten varieties that it has been found necessary to characterize in order to complete the study are, unless otherwise stated, in the author's collection.

KEY TO THE GENERA OF THE TRIBE *Telamonini*

- A. Pronotum armed with a horn or crest.
 - B. Pronotum with an anterior horn arising in front of or above the humeral angles.
 - C. Horn extending anteriorly.....1. *Thelia* A. & S.
 - CC. Horn erect, compressed.....2. *Glossonotus* Butler.
 - BB. Pronotum with a crest, the major portion of which is behind the humeral angles.
 - D. Crest not quadrangular, either overhanging, pyramidal, lobed or stepped.
 - E. Crest overhanging, the dorsal and posterior margin blended into a uniform curve.....3. *Helonica* nov. gen.
 - EE. Crest not overhanging, or if overhanging then the dorsal margin either lobed or stepped.
 - F. Crest definitely stepped, the anterior lobe high and rounding, the posterior lower and quadrangular, humeral angles usually long and acute.
 - 4. *Heliria* Stål.
 - FF. Crest placed well forward and high, or pyramidal and farther back; dorsum sinuate or a slight step on the posterior slope, sometimes wanting.
 - G. Crest arising from metapodium, high, foliaceous.
 - 5. *Telonaca* Ball.
 - GG. Crest placed well back of metapodium, pyramidal, very variable.....6. *Palonica* nov. gen.
 - DD. Crest more or less quadrangular, variable, the dorsum variable, may be sloping but not definitely stepped nor ornamented with a pale spot.....7. *Telamona* Fitch.
 - AA. Pronotum without horn or angular crest. Either low and transversely convex or high and foliaceous throughout.
 - H. Pronotum low and broadly rounding above as seen from the front. Species brown or dark.....8. *Carynota* Fitch.
 - HH. Pronotum high and foliaceous or at least acutely angular as seen from front. Species green.
 - I. Crest low and scarcely foliaceous, metapodium broadly rounding posteriorly without a raised carina.
 - 9. *Tropidarnis* Fowler.
 - II. Crest high and foliaceous. Metapodium upright or only slightly sloping with a raised carina.....10. *Archasia* Stål.

1. Genus *Thelia* A. & S.

Amyot and Serville, Hemip., p. 540, 1843.

Pronotum elongate, triangular, metapodium horizontal or slightly rounding superiorly before the base of the horn, an elongate slender tapering horn extending anteriorly almost

in line with the slope of the dorsum. Humeral angles moderately prominent, rectangular.

This genus was founded by Amyot and Serville in 1843 for *Membracis bimaculata* Fabr. As limited at present it contains only two North American species both widely distributed in the eastern United States.

The nymphs are flattened brown forms with a pair of projections on the front margin of the vertex, a double row of median spines on the abdominal segments, and in the later instars an increasing horn on the pronotum that projects forward. There is a single generation each year, the nymphs appearing in June and July and the adults in July and August.

KEY TO THE SPECIES OF THELIA

- A. Gray ♀ or bimaculate ♂, horn as seen from side usually broad at base and slightly curving upward 1. *bimaculata* Fabr.
 AA. Dark testaceous, uniform, horn as seen from side, usually straight, almost parallel-margined 2. *uhleri* Stål.

1. *Thelia bimaculata* Fab. Plate 1, Fig. 1.

Membracis bimaculata Fabr., Ent. Syst. IV, p. 10, 1794.

Thelia unanimitis Walk., List. Homop. B. M., p. 566, 1851.

Thelia bimaculata Funk., An. Ent. Soc. Am. VIII, p. 140, 1915 (life history).

Thelia bimaculata Kornh., Jl. Morph., 32, pp. 531-631, 1919 (effect of parasitism).

A strikingly large species with a dull gray female and a brown male with brilliant yellow markings. Length (without horn) ♀ 11 mm., ♂ 9 mm.

Pronotum almost equally triangular in both lateral and dorsal views; horn in female broad at base, variable, usually extending for about 4 mm. at an angle of 45°; male horn shorter and more slender; lateral angles prominent, almost right-angled and extending almost their width beyond the eyes.

Color. Female grizzled gray, often faint light lines running obliquely back from horn on either side and a narrow brown line on the dorsum. Male dark brown, a broad yellow stripe on each side from the lateral angle slightly more than half way to apex.

Habitat. The writer has collected this species on black locust (*Robinia pseudacacia*) in southeastern Iowa, southern Wisconsin, Ohio, Ontario, District of Columbia, Maryland, and Virginia, and

has examined examples from Kansas, Illinois, Pennsylvania, New York, New Hampshire, Rhode Island, New Jersey, Delaware and North Carolina. Van Duzee reports it from Quebec and Harris from Massachusetts. Its distribution is limited by that of the black locust, the nymphs never occurring on any other host, the adults and larger nymphs usually resting on the branches near the base of a twig or leaf, often alongside the sharp spines which their projecting horns somewhat resemble. Funkhouser has given a full account of the life history and habits. Kornhauser has made an elaborate study of the parasite and the effect of parasitism in changing the structural characters and especially the sexual characters and coloration. Funkhouser found the eggs laid at the base of the trees and the young nymphs feeding there. The writer has found eggs and young nymphs on the smaller branches and Kornhauser in correspondence states that he has brought branches into the laboratory and allowed the eggs to hatch. Apparently eggs are laid in different places under different conditions. Kornhauser gives an interesting description of the collars built around the bases of the trees by ants in which third to fifth instar nymphs were found in abundance.

2. *Thelia uhleri* Stål. Plate 1, Fig. 2.

Thelia uhleri Stål. Öf. Vet. Akad. Forh., XXVI, p. 248, 1869.

Smaller than *bimaculata*, uniform rich brown, with a flat parallel-margined horn almost continuing the line of the dorsum. Length 8 mm. (without horn).

Pronotum long, triangular in both views, dorsum low and broadly evenly rounding; face and metapodium densely hairy, pronotum sparsely hairy, uniformly punctured with no definite lateral carinae; horn long, flattened and scarcely narrowed towards the apex. Lateral angle slightly obtuse and exceeding the eyes by little more than half their width.

Color. Mahogany-brown, usually a few pale dots and an obscure pale line running obliquely backward from each side of the horn; occasionally the median carina is light-margined back of the horn.

Habitat. The writer has collected this species on the wild plum (*Prunus* spp.) in South Dakota, Iowa, Minnesota, and Wisconsin, and has examined examples from northwestern Nebraska (Barber); Kansas (DeLong); Illinois (Ill.); Ohio (Osborn); Pennsylvania, New York and Maryland (U. S. N. M.) and Kingston, Ontario (Van Duzee-Ames).

In the writer's experience this species is found only on isolated clumps of old plum trees. The adults usually conceal themselves in the angle where a fresh watersprout a half inch or more in diameter comes out from the trunk or where two of these touch each other, their brown color together with the pale dots giving the exact appearance of the young plum growth with its "bloom" still present. The nymphs have a still more powdery appearance and are found on the smaller branches, usually in the angle of a twig. There is a single generation in a year, the nymphs appearing in June and early July, the adults in July and August.

2. Genus *Glossonotus* Butler.

Glossonotus Butler, *Cistula Entomologica*, II, p. 222, 1877.

Pronotum short, triangular, the anterior part elevated into a tongue or horn often nearly as high as the pronotum is long. Metapodium almost horizontal, the upper margin rounding back before entering into the outline of the horn, horn often slightly overhanging the metapodium. Humeral angles prominent, usually acute.

Butler erected this genus for *Thelia acuminata* Fabr., apparently the only one of the group with which he was acquainted. Five species are now recognized, all apparently limited to the deciduous forest region of North America.¹

Little is known of the nymphal stages of most species. The nymphs of *G. acuminata* resemble those of *Thelia* but the horn is more nearly erect. All of the species are apparently single-brooded, the adults appearing in late June and July and continuing into August. In this genus as in several others the females have larger and more characteristic horns and longer humeral angles than the males.

KEY TO THE SPECIES OF *Glossonotus* (FEMALES)

- A. Horn as seen from the side slightly constricted near base, definitely foliaceous and enlarged at apex. Pronotum without median stripes or if partially striped with definite lateral markings.
 - B. Large, pronotum obscurely marked, humeral angles large, acute1. *acuminatus* Fabr.
 - BB. Size medium, pronotum pattern definite, humeral angles rectangular2. *crataegi* Fitch.

¹ Funkhouser lists *gibbosa* Walk. from Brazil as a *Glossonotus* and credits Butler *Cist. Ent.* 2, p. 222, with the reference but this is an error—Butler referred this species to *Telamona*.

- AA. Horn usually broadest at base. Pronotum without lateral pale markings, usually with a broad median stripe.
- C. Horn high, tapering or constricted near tip, no lateral markings.
- D. Light testaceous brown with a broad stripe. Horn slender, tapering 3. *turriculatus* Emm.
- DD. Unicolorous dark brown or with a narrow stripe. Horn variable, usually foliaceous at apex. Metapodium hairy. 4. *nimbatus* Ball.
- CC. Horn low, nearly as broad as its height. Metapodium not hairy 5. *univittatus* Harr.

1. *Glossonotus acuminatus* Fabr. Plate 1, Fig. 3.

Membracis acuminatus Fabr. Syst. Ent., p. 675, 1775.

Gray-brown, mottled, with the dark crest extremely high, tongue-like and foliaceous at apex. Humeral angles prominent and acute. Length 10 mm., width 6 mm., height 8 mm.

Crest upright or slightly overhanging the metapodium, conical at base, constricted in the middle and foliaceous at the rounding apex, humeral angles long, acute, almost half longer than the eye. Pronotum long, the acute apex usually exceeding the elytra. Color pattern dull and obscure but similar to that in *crataegi*.

Habitat. The writer has collected this species on black oak (*Q. velutina*) in Iowa, Minnesota and Wisconsin and has examined examples from Arkansas (McElfresh); Missouri; Kansas; Illinois (Osborn); Michigan (U. S. N. M.); Pennsylvania; New York (Ridgeway); Ontario (Van D. Coll., Ames); Rhode Island; Massachusetts (Woodruff); Connecticut (New York State); New Jersey (Barber) (Davis); Maryland; Virginia (Heid. Coll.); and North Carolina (Cornell).

The nymphs are found skillfully concealed in the crotches of the smaller branches in June and early July. The adults appear in late June and July and disappear soon after. They usually rest head down on the underside of the smaller branches coming out from the main trunk and well up out of reach. A long collecting bottle made out of one-inch glass tubing fastened by rubber bands to the end of a net handle, a good eye and a steady hand, made their capture easy.

2. *Glossonotus crataegi* Fitch. Plate 1, Fig. 4.

Thelia crataegi Fitch. Cat. Ins. N. Y., p. 52, 1851.

Rich brown and cream in a striking but variable pattern, crest broad, foliaceous, length 8 mm., width 4 mm., height 6 mm.

Crest resembling *acuminatus* but shorter, quite variable; humeral angles rectangular, no longer than eye, pronotum with apex slightly rounding, scarcely equalling the elytra; males much smaller and often with much shorter crests.

Color. Cream and chestnut-brown, face and most of metapodium creamy, humeral angles and crest chestnut irregularly margined with dark brown, a large irregular spot below crest creamy, a transverse creamy band a little nearer apex than crest, sometimes wanting, often a median creamy vitta behind the crest.

Habitat. The writer has collected this species on the hawthorn (*Crataegus* spp.) in Iowa and Ontario and has examined examples from Manitoba and Missouri (U. S. N. M.), Illinois (Titus), Michigan (Hungerford-Kansas), Ohio (Osborn), Pennsylvania (Davis), New York (Knight), Maine (Dickenson—A. M. N. H.), Massachusetts (Cate, U. S. N. M.), West Virginia (Davis) and Maryland (Uhler, U. S. N. M.).

This is a strikingly colored and easily recognized species but very difficult to capture on account of the spiny nature of its host plant. It was found quite commonly in July in company with two other species of treehoppers on long watersprouts growing inside the head of a tree at Ames, Iowa. Dr. Knight found it in abundance in July on quince at Batavia, New York, and on *Crataegus* in Iowa. It has been taken on apple and crab apple. Before the introduction of cultivated fruits it was undoubtedly confined to the wild species of *Crataegus*. The Fitch type in the New York State Museum, while faded, still shows the typical *crataegi* pattern and shape and leaves no question as to the identity of this species.

3. *Glossonotus turriculatus* Emm. Plate 1, Fig. 5.

Telamona turriculata Emm., Agr. of N. Y. V., p. 155, pl. 3, fig. 1, 1854.

Thelia turriculata Godg., Bull. Ill. St. Lab. Nat. Hist. III, p. 412, 1894.

Glossonotus univittatus Van D., Buff. Soc. Nat. Sci. IX, p. 58-59, 1908. (Not Harr.)

Glossonotus univittatus Funkh., Cornell Exp. Sta. Mem. II, p. 246, 1917. (Not Harr.)

Glossonotus univittatus Funkh., Insects. of Conn. Pt. IV, Hemip., p. 184, 1923.

Glossonotus univittatus Van D., Catalogue of the Hemiptera, p. 534, 1917. (Not *G. turriculatus* of the Van D. catalogue).

Grayish testaceous shading to dark brown against the broad dorsal vitta, crest extremely high, slender, erect or slightly overhanging the metapodium. Length 10 mm., width 5 mm., height 7 mm.

Horn slender, anterior, twice as high as its width, variable but usually slightly overhanging with the apex rounding back to form a slight angle behind. Humeral angles about equalling the eye, slightly acute. Face and metapodium pubescent, pronotum long, acute.

Color. Gray shading to brown on crest and along the margins of the broad creamy white dorsal vitta, an oblique dark cloud at apex of elytra.

Habitat. The writer has collected this species on *Crataegus* in Iowa and Wisconsin and examined examples from Iowa (from *Crataegus* Knight) Nebraska (Pierce), Kansas (DeLong), Missouri (Uhler, U. S. N. M.), Illinois (Ill.), Ohio (Osborn), Pennsylvania (DeLong), New York (many coll.), New Jersey (Davis), Massachusetts (Dickenson, A. M. N. H.), Long Island (Brooklyn Mus.), North Carolina (U. S. N. M.) and Georgia (Davis).

On July 6, 1919, the writer found an isolated tree of hawthorn at Ames, Iowa, that had several lusty watersprouts growing up through the older branches. The smaller upright branches of these watersprouts had an almost continuous row of treehoppers on the sunny sides, about evenly divided between this species and *T. crataegi*. Capturing them among the spiny branches was however another matter. They were all adults at this time and no larvae have been taken. Isolated examples have been taken on different oaks but they may have been accidental resting places. The other species of this genus are so restricted in food habits and it is doubtful if this species would have two food plants as different as thorn and oak.

There has been much confusion with reference to the application of names in this group as discussed under *univittatus*. There can, however, be no question but that this is the species Emmons described as having "a high narrow crest, rising somewhat in advance of the face; posteriorly the concavity is large, and continuous with the entire back." His figure shows an extremely tall overhanging crest, a long acute pronotum with a broad white vitta bordered by dark margins, characters that at once separate it from Harris' species or *nibatulus*.

4. *Glossonotus nibatulus* Ball. Plate 1, Fig. 6.

Glossonotus turriculatus Van D., Buff. Soc. Nat. Sc. IX, p. 59, 1908.

Glossonotus turriculatus Van D., Cat. Hemip., p. 534, 1917
(not Emm.)

Glossonotus nimbatulus Ball, Proc. Wash. Acad. Sc. XV,
p. 200, 1925.

Resembling *turriculatus* but smaller, darker, with a tall foliaceous variable crest resembling that of *acuminatus*. Length 7 mm., height 6 mm., width 4-.5 mm.

Horn anterior and nearly vertical, broad and high, constricted near middle, nearly evenly foliaceous at apex, as seen from front broadly inflated from just above the very short and weak lateral angles, tapering evenly just before the apex. Lateral angles obtuse, about one-half the width of the eye. Pronotum moderately acute in both planes.

Color. Uniform chestnut or darker varying to almost black, with pale points on the sides of the horn; in the lighter specimens a narrow light median stripe from the apex of horn to apex of pronotum, becoming narrower in the darker specimens and occasionally wanting.

Habitat. Examples have been examined from Karner, N. Y. (N. Y. State); Pennsylvania (Bak., U. S. N. M.); New Jersey (Davis, Barber); Long Island (Brooklyn); Framingham, Mass. (Frost, A. M. N. H.); White Mountains, N. H. (Ball).

The uniform dark color and the long inflated foliaceous horn will at once distinguish this distinct species which appears to be confined to scrub oak (*Quercus nana*) growing in sandy or rocky locations.

5. *Glossonotus univittatus* Harr. Plate 1, Fig. 7.

Membracis univittatus Harr., Rep. Ins. Mass., p. 180, 1841.

Thelia univittata Godg., Bull. Ill. St. Lab. Nat. Hist. III,
p. 412, 1894. (Synonymy O. K.).

Thelia godingi Van Duzee, Ent. News VI, p. 203, 1895.

Glossonotus godingi Van Duzee, Bull. Buff. Soc. Nat. Sci.
IX, p. 59, 1908.

Telamona dorsalis Buckton, Monograph of the Membracidae, p. 197, pl. 43, fig. 3, 1903.

Glossonotus godingi Van Duzee, Cat. Hemipt., p. 535, 1917.

Glossonotus godingi Funkh., Insects of Conn., p. 184, 1923.

Resembling *turriculatus* but shorter, stouter and darker with a much shorter, broader horn. Length 9 mm., height 5 mm., width 5.5 mm.

Testaceous shading to dark brown along the margin of the broad median, white vitta, crest upright very variable, often but little higher than wide, rarely twice as high, broad at

base, parallel margined or occasionally slightly knobbed. Humeral angles broadly rounding to right angled scarcely equaling the eye in width. Pronotum much broader and shorter than in *turriculatus*.

Habitat. The writer has collected this species in Colorado, Iowa and Wisconsin and has examined examples from New Mexico (Cockl., U. S. N. M.); Arkansas (McElf.); Manitoba (Wells, U. S. N. M.); Minnesota (Minn.); Michigan (Hill); Illinois (Godg., U. S. N. M.); Indiana (Bak., U. S. N. M.); Ohio (Osborn); Pennsylvania (Bak., U. S. N. M.); New York (Fitch, N. Y. St.); Canada (Bak., U. S. N. M.); New Hampshire (N. H.); Massachusetts (Harr., Bost. S. N. H.); New Jersey (Davis); Maryland (Uhl, U. S. N. M.); Georgia (Davis). It is one of the most common and widely distributed species of the group extending along the Rocky Mountains from New Mexico north to Montana and east through Manitoba, Ontario and Quebec on the north, to at least Georgia and Arkansas on the south. Harris and Fitch both give oak as the food plant. The writer has found both sexes on oak in numbers in Iowa and Wisconsin.

There has been much confusion with reference to the specific name of this species. Harris described it in 1841 as a *Membracis* from examples from Massachusetts, and later sent his collection to Dr. Fitch² who placed it in the genus *Thelia* and listed it in his catalogue of the Homoptera of New York in 1856. This species was referred to frequently and apparently correctly from this time on until 1894 so that the references in the Goding catalogue of that date are all correct.

In 1895 Van Duzee assigned the name *univittata* Harr. to the tall species described as *turriculata* by Emmons and described this species as *Thelia godingi*. The same error was repeated in his studies of North American Membracidae and again in his Catalogue and has been followed by Funkhouser in the Membracids of Cayuga Lake Basin and in the Membracidae of the Hemiptera of Connecticut.

The writer has twice visited the Boston Museum of Natural History and studied the types of this species, a pair labeled "200 N. H. on scrub oak," in the Harris collection. The female is a typical

² Dr. Fitch in the introduction to his Catalogue of the Insects of the State Cabinet of Natural History says, "An acknowledgment is due Dr. T. W. Harris of Harvard University who has been so kind as to place temporarily in my hands his entire collection of Homoptera including the several species named in his catalogue."

example of the species, the male has an unusually broad hump. They fit the Harris description where he says, "It is about 4/10 of an inch in length, the thorax is brown, has a short obtuse horn, extending obliquely upwards from its fore part." The Museum collection has eleven specimens of this species from Massachusetts but no examples of the tall horned *turriculata*. The Fitch Collection in the State Cabinet of Natural History at Albany has a typical female of the Harris species and a male of true *turriculatus* along with it. The much shorter horns of the males in this group make this a natural mistake. The Fitch Collection in the National Museum contains a single typical female labelled *univittatus* Harr. Dr. Fitch evidently correctly recognized that the short broad species was Harris', and, as credited by Emmons, no doubt assisted that writer in determining that the species described as *turriculatus* was new. There can be no question as to the identity of these two species. Harris' "has a short obtuse horn" could only fit the species represented by his types and the female in the Fitch collection, while on the other hand Emmons' figure and description of *turriculatus* as noted above could only apply to that species. Van Duzee gives no type designation for his *T. godingi* but states that he had taken "a number of individuals about Buffalo," and that he sent one example to Dr. Goding. The writer has examined the examples in the Goding collection now in the National Museum, and examples in the Van Duzee collection at Ames labeled types and finds them typical of the Harris species.

Glossonotus univittatus var. *pumilus* n. var. Plate 1, Fig. 8.

Resembling *univittatus*, smaller, with an even lower and usually narrower horn. Pale gray, shading to brown along the white vitta in the female darker with a dark brown hump in the male. Length 7 mm, height 4.5 mm.

Holotype ♀ and allotype ♂ Palmer Lake, Colorado (Ball) paratypes, Rifle, Colorado (Ball), Veta Pass, Colo. (Drake), Colorado and New Mexico (U. S. N. M.). The writer has found this variety only on the low growing "scrub" oak (*Quercus gambelii*) in July while the two females from Dr. Drake were taken in August.

3. Genus *Helonica* nov. gen.

Resembling *Heliria* in the overhanging anterior lobe of the crest but entirely lacking the differentiation into a posterior lobe. Similar to *Telamona* in many characters but with larger humeral angles and an anterior projecting crest.

Pronotum relatively broad and short, scarcely reaching the apical cell of the elytra. Crest relatively broad at base,

placed well back on the metapodium, moderately high, the apex consisting of an overhanging lobe from which the dorsal and posterior faces are united in a broad curve, extending into the curve of the pronotum with only a faintly indicated posterior angle, the whole structure resembling a cornucopia. Humeral angles long, acute.

Type of the genus *Thelia excelsa* Fairm.

1. *Helonica excelsa* Fairm. Plate 1, Fig. 9.

Thelia excelsa Fairm., Ann. Ent. Soc. Fr. Ser. 2, IV, p. 310, 1846.

Telamona projecta Butler, Cist. Ent. II, p. 221, 1877.

Telamona magniloba Godg., Bull. Ill. St. Lab. N. H. III, p. 422, 1894.

Telamona albidorsata Fowler, Bio. Cent. Amer., Homoptera, p. 145, Table IX, fig. 8, 1896.

Telamona cucullata Van Duz., Bull. Buf. Soc. Nat. Sc. IX, p. 70, 1908.

Resembling an example of *Heliria scalaris* with the posterior lobe of the crest merged into the anterior and much paler in color. Length, female, 11 mm., width 7 mm., height 5.5 mm. Length, male, 8 mm.

Pronotum and crest as in the genus, crest very variable in length and therefore in relative shape, sometimes narrow at base and much overhanging, again much broader and more upright. There is often a very slight angle on the posterior slope. Metapodium hairy; humeral angles long, acute; the posterior margin long, straight, sloping anteriorly; anterior margin curved, apex bluntly rounding, one-half longer than the eye.

Color. Pale brown with darker markings on the upper part of the metapodium just below the overhanging crest and margining the white lined posterior slope of crest, sometimes extending to the costa.

Habitat. The writer has examined examples from Galesburg, Ill., Stromberg (Ill. Coll.; Goding and Uhler Coll. U. S. N. M.); Ithaca, N. Y. (Cornell Coll.); Maryland (Uhl. Coll. U. S. N. M.); and the Fairmaire and Fowler types were from Mexico. Stromberg labeled his material from "wild grape." Dr. Knight sent a long and variable series taken on wild grapes at Ames, Iowa. Dr. Knight's examples were taken late in June, Stromberg's in July.

Fairmaire described this species from Mexico in 1846 as a *Thelia*. Fowler in the *Biologia*, Table 9, Fig. 4 and 4a, figures the type indicating a rather large, broad-crested female which he placed in *Telamona*. Butler described *projecta* in 1877 from an example in the British Museum without locality label. His figure has a nar-

rower crest than that of Fairmaire's type but is well within the normal variation and is undoubtedly the same species. Goding described *magniloba* in 1894 from a pair from Illinois (Stromberg). This description follows *T. excelsa* in his catalogue and he lists *excelsa* as occurring in Missouri and Illinois; but he gives no character by which they could be separated. The types are in the National Museum and are apparently from the same lot as those from Stromberg in the Illinois Collection which shows a wide variation in size and shape of crest including both *projecta* and *excelsa* forms. In 1896 Fowler in the *Biologia* described *Telamona albidorsata* from a single male from Vera Cruz. The writer from the figure and white lined dorsum thought that it was a *Glossonotus* and sent examples to W. E. China for examination and comparison. He reports that the humeral angles are more prominent and the posterior process much longer and more acute while the yellow mottling is not as distinct as shown. On further study in the light of these facts it was discovered that some narrow crested males of *excelsa* show this white line and agree with Fowler's "obtuse and hardly perceptible angle behind the middle." The unique female type of *excelsa* and the unique male type of *albidorsata* represent the two extremes in variation of crest width, and it is little wonder that their relationship was not suspected. The variation in size and in size of the humeral angles is typical of the sexes. In 1908 Van Duzee described *cucullata* from examples from Ithaca. Later in the same issue he notes that it is the same as *projecta* Butler, the illustration of which he previously overlooked. He placed this species in the genus *Telamona* but pointed out its relation to *Heliria* and *Thelia*.

Van Duzee remarks that it has the wing venation of an *Antianthe* which if correct would transfer this species to the tribe *Smiliini*. This must have been from an observation of a variation on an individual wing. An occasional variation of this kind not infrequently occurs in all of the genera under consideration but an examination of a considerable series of this species indicates that this variation is rare and there can be no question as to this form belonging in the *Telamonini*.

4. Genus *Heliria* Stål.

Heliria Stål. Öf. Vet. Akad. Forh. XXIV, p. 556, 1867.

Large, robust, resembling *Telamona* but with crest more prominent and consisting of two lobes, the anterior highest, humeral angles prominent.

Pronotum long, low; the metapodium short, convex; crest very variable, usually broad, consisting of two definite lobes,

the anterior one high and usually rounding, the posterior one lower with a definite step or at least a sinuation and the junction marked by a light area; posterior process low, acute, but rarely reaching to the apex of the elytra.

Type of the genus *Thelia cristata* Fairm.

KEY TO THE SPECIES OF *Heliria* (FEMALES)

- A. Humeral angles usually long and acute, longer than their basal width except in *molaris*, species large, not testaceous.
- B. Crest large, anterior lobe long, foliaceous.
- C. Anterior lobe of crest overhanging anteriorly.
 - D. Anterior lobe high, knob-like; posterior lobe long, low, highest at posterior angle.1. *cristata* Fairm.
 - DD. Anterior lobe little higher than posterior.
 - 2. *gibberata* Ball.
- CC. Anterior margin of crest upright or sloping posteriorly.
- E. Crest definitely longer than its height.
 - F. Humeral angles longer than their basal width, narrow at base 3. *mexicana* Stål
 - FF. Humeral angles broader at base than long, crest arising back of metapodium.
 - G. Crest with anterior lobe broad, pyramidal, the apex slightly rounding; posterior lobe sloping, the angle obtuse. 4. *sinuata* Fowler.
 - GG. Crest with the anterior lobe lower, posterior lobe horizontal with a definite step and an acute angle.
 - H. Crest with anterior lobe arising abruptly, definitely higher than posterior. 5. *fitchi* Ball.
 - HH. Crest with the anterior lobe arising in a long slope to the line of the posterior one.
 - 6. *molaris* Butler.
 - EE. Crest with height and width about equal.
 - I. Crest much shorter than the posterior part of pronotum, oblique with a vertical inflation on either side7. *clitella* Ball.
 - II. Crest about equal to the length of the posterior pronotum, not inflated 8. *gemma* Ball.
 - BB. Crest small, anterior lobe narrow, pyramidal, acute; humeral angles much longer than their basal width.
 - 9. *strombergi* Goding.
 - AA. Humeral angles shorter, not exceeding their basal width or the breadth of the eye. Species smaller, brown or testaceous.
 - J. Crest broad, anterior lobe knob-like, overhanging 10 *scalaris* Fairmaire.
 - JJ. Crest narrow, anterior margin upright or sloping posteriorly. 11 *praealta* Fowler.

The representatives of this genus are the largest and most striking treehoppers occurring in the temperate regions of America. They are very rare in collections, however, no doubt largely on account of their remarkable agility. Only an occasional accidental capture has been made in the past, thus no one has determined host plants. Van Duzee in his "Studies of North American Membracidae" records only two species; Funkhouser in his Cornell List records only one, and in the Connecticut list only two, and these with the food plants unknown. Eleven species are discussed in this paper. Of these the writer has collected and determined food plants of nine. The nymphs have a pair of anterior projections between the eyes, a large pronotal hump and in the later instars a constantly enlarging projection from the anterior margin of this hump. The abdominal segments bear two adjacent rows of dorsal spines. There is a single annual generation, the nymphs appearing in late May and June and the adults in July and August in the Iowa-New York latitude.

1. *Heliria cristata* Fairm. Plate 1, Fig. 10.

Thelia cristata Fairmaire, Ann. Soc. Ent. Fr. Ser. 2, IV, p. 311, pl. 5, Fig. 14, 1846.

Telamona fagi Fitch, Homop, N. Y. St. Cab. p. 51, 1851.

Telamona acclivata Emmons, Nat. Hist. N. Y. Ins., p. 155, pl. 3, fig. 5, 1854.

Large, tawny or mottled, crest with a high overhanging anterior lobe and a low acutely angled posterior one. Female: length 11 mm., width 7 mm., height 6 mm.; male: length 10 mm.

Pronotum long, low, acute with weak striations; crest of medium length placed well back of the humeral angles rather low with the anterior half knob-like, overhanging in front, abruptly twice as high as the posterior half. Posterior half low, horizontal, the posterior angle definite, often slightly elevated and acute. Humeral angles inclined, their apices curving forward, much longer than the width of eye, broad, acutely angled, the apex rounding.

Color. Pale tawny, shading to gray-brown, slightly washed and mottled with fuscous, with a faint pattern emphasized around the base of the crest and running obliquely back to the costa. The humeral angles have a dark stripe both above and below with the anterior margin light.

Habitat. The writer has collected examples at Ames, Iowa, and Lake Geneva, Wisconsin, and has examined specimens from Kansas

(DeLong and Kans. Univ. Coll.); Illinois (Ill. Coll. and Wescott); Pennsylvania (Phil. Acad.); New York (Fitch Coll., Albany, and U. S. Nat. Mus.); New Jersey (Davis and Barber Colls.); Maryland (Uhl., U. S. N. M.); North Carolina (Cornell); one female, Louisiana (Uhl., U. S. N. M.); one male, Florida (Minn.), one male, Dallas, Texas, June 7, 1905 (Bishopp, U. S. N. M.), and Fairmaire described it from Mexico. It will probably be found throughout the deciduous forest belt of eastern North America. The writer has taken this species in late June (males) and early July on the burr oak except for what was no doubt an accidental capture on a black oak in a burr oak locality. Fitch credits *fagi* to beech but this was an unique example and no doubt an accidental capture.

This is a strikingly distinct species in the low crest with the large overhanging knob-like anterior lobe. Fowler in the *Biologia* figures Fairmaire's type, showing both the knob and the acute posterior angle. The writer has examined the Fitch type of *Telamona fagi* in the New York State Collection. It is a male (No. 687) and agrees in all respects with the males of this species. The anterior lobe, "double the height of the posterior half," would at once separate it from every other species except *scalaris*. Funkhouser placed it as a synonym of this species in his Cornell List but the long humeral angles at once bar it from consideration there. Emmons' figure of *Telamona acclivata* is typical of this species except from the green color which he does not mention in his description. The structural characters, however, leave no room for doubt that it belongs here. The Fitch Collection in the National Museum has a female of this species taken July 11, '82 which bears a green label "*acclivata*" and there is a female in the Uhler collection similarly labelled.

2. *Heliria gibberata* Ball. Plate 1, Fig. 11.

Heliria gibberata Ball. Jl. Wash. Acad. Sc. XV; p. 200; 1925.

Slightly smaller and darker than *cristata*, with the crest nearly uniform in height and only slightly overhanging. Female: length 10 mm., width 7 mm., height 5 mm.; male: length 8 mm.

Pronotum long, low, acute, weakly striated, crest prominent, situated as in *cristata* but with the posterior lobe long, almost as high as the anterior and nearly level, the anterior lobe rising in a gentle curve to the rounding and only slightly overhanging apex. Humeral angles very prominent in the

female; resembling *cristata*. The males are shorter with a lower and less differentiated crest and with the humeral angles much reduced.

Color. Pale creamy ground with irregular dark mottlings giving a grizzled appearance, these usually emphasized on anterior and posterior margins of crest, the latter often extending as an oblique stripe to costa.

Habitat. Collected in July by the writer and H. H. Knight in numbers on hackberry (*Celtis occidentalis*) at Ames, Iowa, a fine series from Galesburg, Ill., Stromberg (Ill. Coll.), (Goding Coll., U. S. N. M.); one female, Lincoln, Neb. (Osborn Coll.); and one from Louisiana (U. S. N. M.). In the American Museum is a specimen labelled "Post Oak Matausch," probably from New Jersey where he did most of his collecting. Both adults and nymphs were taken from hackberry. The nymphs were abundant in June and early July and were found feeding on the underside of small branches, usually resting against a leaf base or scar. The adults rest on larger branches where their resemblance to the rough warty bark affords almost perfect protection. The difference in the shape of both lobes of the crest renders this a strikingly distinct species. The hackberry occurs from Quebec and Manitoba south to North Carolina and Louisiana and doubtless where collectors learn to detect it this species will be found in favorable locations throughout the greater part of this range.

3. *Heliria mexicana* Stål. Plate 1, Fig. 12.

Telamona mexicana Stål. Öfv. Vet. Akad. Forh., p. 249, 1869.

Telamona mexicana Fowler. Biologia Homop., p. 144, pl. 9, fig. 5, 1896.

Heliria cornutula Ball. Jl. Wash. Acad. Sc., XV: p. 201, 1925.

Resembling *gibberata*, crest slightly longer, anteriorly upright or slightly retreating, superficially resembling *Telamona maculata*. Female: length 10-11 mm., height 6 mm., width 7 mm.; male: length 8.5 mm.

Pronotum low, the apex abruptly pointed, striations becoming definite posteriorly; crest larger, longer than in *gibberata* the anterior margin arising perpendicularly from the face of the metapodium, excluding the median convexity; anterior lobe large, anterior angle broadly rounding; posterior lobe but little lower than the anterior, upper margin horizontal, posterior angle almost right-angled. Humeral angles longer

than in *cristata*, rather narrow at base, then expanded and rounding to the long apices, as a whole, extraordinarily ear-like. Male crest smaller, the anterior margin sloping, the anterior lobe inclined to be broadly pyramidal.

Color. Pale gray, sometimes with a greenish tinge, mottled with darker, usually the dark color is emphasized across the metapodium; on the upper part of crest and in two bands behind the crest; two examples are closely and almost uniformly irrorate with dark.

Habitat. Two females were swept from sweet gum (*Liquidambar*) in July along the edge of a swamp at Sanford, Florida, by the writer. Examples have been examined from Long Island, N. Y. (Olsen and A. M. N. H.); Elizabeth, N. J., and Bronx, N. Y., October 3, 1905 (Matausch Coll. A. M. N. H.); two females, Pine Island, New York (Schaeffer, Brooklyn Mus.); a female, Hummelstown, Pa., Sept. 8, 1920 (Knull, De Long Coll.); a male, Maryland (Uhler Coll., U. S. N. M.); a female, Tennessee (Baker Coll. U. S. N. M.); a male from North Carolina (U. S. N. M.), and Stål's type from Mexico.

This species is intermediate in character between *gibberata* and *sinuata*. It can be readily distinguished however from both by its large upright crest and the constricted base of the humeral angles. The shape and coloring of the crest resemble that of the upright flakes of bark on the sweet gum.

Stål placed *mexicana* in *Telamona* although he emphasizes the extremely large humeral angles. His description and Fowler's figure in the *Biologia* indicate a much smaller insect (7 mm.) than here described. The face view shows the humeral angles with strongly upturned margins. The writer was misled by these differences and the fact that this species had only been found at that time from Long Island to Maryland. Later, collecting them in Florida and finding the food plant was the subtropical sweet gum led to a re-examination of the matter and the conclusion that Stål's type was either a male of this species or a small parasitized female and that the curved margins shown in Fig. 5b was a mistake in shading or an attempt to show dark markings as the colored figure does not indicate that they are curved. Matausch records a *Telamona* "near *Heliria*" from *Liquidambar* in New Jersey which he says was like one taken in the Bronx the previous year. This probably refers to this species but he apparently did not label his material.

4. *Heliria sinuata* Fowl. Plate I, Fig. 13.

Telamona sinuata Fowler. Bio. Cent. Amer., Vol. II, p. 144, table 9, fig. 7, 1896.

Telamona ehrhorni Ball. Proc. Biol. Soc. Wash., XVI, p. 180, pl. 1, fig. 4, 1903.

Resembling *mexicana* but with the crest shorter and placed well back of metapodium. Darker, shining. Female: length 10 mm., width 6 mm., height 5.5 mm.; male: length 9 mm.

Pronotum low with about four irregular but well marked striae arising below the crest and running to the apex. Another group of striae arise at the anterior base of the crest and spread out irregularly on its surface. Crest rather short, set well back of the metapodium, the anterior lobe an obtuse pyramid, the posterior lobe short but high, resembling a step on the posterior face of the pyramid. The crest is sharply and deeply compressed at the points, a line at the anterior base, and depressed oval near the apex of pyramid and a larger oval in front of the posterior base, behind which the posterior margin is much inflated. Humeral angles shorter and broader than in *mexicana*, broad at base, acutely angular with the margins straight.

Color: Mottled black and white, shining. Ground color, creamy-white with irregular black mottling, usually an irregular band across the metapodium, most of the crest, an oblique stripe to the costa and an apical band, dark. The more definitely marked specimens show a pair of large oval light spots on the upper face of the metapodium, a semi-circular spot below the crest, a narrow line curving from the front of the crest around to the "step" and a transverse band back of crest and extending up its broad posterior face, white.

Habitat. The writer took four females from the "Blue" oak (*Quercus oblongifolia*) on the slopes of the Santa Rita Mts., Arizona, September 20, 1930. These oaks were isolated from any other trees and there can be little question about their food plant, especially as their color and markings blend perfectly with the color of the bark of the larger twigs. A single female from the Huachuca Mountains, Arizona, Aug. (H. Skinner, Phil. Acad.), two pairs from the same mountains (Brooklyn Mus.); one male from Arizona (Ehrhorn); and a male from Koehler, N. Mex., Aug. (Walton, U. S. N. M.). Fowler described it from Guerrero, Mexico. It is probably confined to the mountains of the extreme southwest region.

This is a striking and distinct species in color and markings as well as in the heavy striae and compressed crest. *Telamona ehrhorni*

was described from a single male much smaller and more highly ornamented than the other examples. If further collecting should show that this was a constant form it would be worthy of varietal rank. See *H. clitella* for a discussion of Van Duzee's reference of an example in the Cornell collection to this species.

5. *Heliria fitchi* Ball. Plate I, Fig. 14.

Helira fitchi Ball. Jl. Wash. Acad. Sc., XV; p. 202, 1925.

Resembling *sinuata* but much lighter colored with a lower crest and a more definite "step." Length 11 mm., width 6 mm.

Pronotum very long, striae normal, crest moderate, placed well back of metapodium, intermediate in length between *sinuata* and *clitella*, anterior margin quite sloping, posterior margin vertical, anterior lobe almost uniformly rounding above, one-third higher than the posterior one, posterior lobe almost square. Humeral angles very short for this group, slightly acutely angled with the margin rounding.

Color. Pale creamy with quite definite dark mottlings, as follows: most of the crest including an oblique band to the costa, a spot on the costa before this and most of the apical region of pronotum. The oblique stripe and the apical markings are separated by a white band which is enlarged on the median line and contains a definite dark spot. One example is much darker than the others and the old examples are pale brown rather than creamy.

Habitat. Charter Oak, Pa., June 22 and July 9 (De Long Coll.); New York (Fitch Coll., U. S. N. M.); Maryland (Uhler Coll., U. S. N. M.).

This is a strikingly distinct species although closely related to *sinuata* and *clitella*. The examples from the Fitch collection in the National Museum are labeled *Telamona concava* Fitch and one parasitized example, probably a female, is labeled "type." This is not the species represented by the Fitch type in the Albany collection as will be discussed under *concava*. Apparently Fitch described *concava* from a single example which was later placed in the Albany collection. Later he collected this species which superficially resembles that species and placed it in his collection under the name *concava*. This may have been what misled Emmons into later describing the true *concava* as *ornata*.

6. *Heliria molaris* Butler. Plate I, Fig. 15.

Telamona molaris Butler. Cist. Ent., II, p. 222, pl. 3, fig. 13, 1877.

Telamona irrorata Godg. Bull. Ill. St. Lab. N. H., III, p. 418, 1894 (preoccupied).

Telamona dubiosa Van Duzee. Check List of Hemip., p. 59, 1916 (new name).

Telamona wescotti Funk. Biol. of the Memb. Cayuga Lake Basin, p. 253, pl. 26, fig. 17, 1917 (not Godg.).

A low heavy set dark species resembling *clitella* but with a lower longer crest sloping in front. Length 11 mm., width 6 mm.

Pronotum long low, equalling the elytra, striations prominent and reaching the apex. Crest set well back long and low, the anterior margin a long gradual slope from the metapodium. The dorsum nearly horizontal with only a slight sinuation between the two lobes; posterior margin slightly overhanging, the angle acute. Humeral angles very short almost right angled, not as prominent as in *fitchi*.

Color. Dark sooty brown; the darkest of the northern representatives of the genus with only slight mottlings of gray in the lighter examples.

Habitat. Nymphs and adults have been taken by the writer from the burr oak at Ames, Iowa; Lake Geneva, Madison and Lewis, Wisconsin. Examples have been examined from Ill. (Goding, Ill.), Lake Superior, Minn. (Lugger, Minn.), Grimsby, Ont. (Uhl., U. S. N. M.) and Butler's type was from "Saskatchewan" (Bourgeau).

Butler's species had never been recognized as his description is short and the figure small and very poor, the "bifid process" being much exaggerated. Examples of *Palonica pyramidata*, *P. tremulata* and *Heliria praealta*, the three species of large treehoppers that might possibly occur in Saskatchewan were sent Mr. W. E. China of the British Museum for comparison with the type. Mr. China reported that the type (♂) was closest to *H. praealta*, but was much larger, more coarsely punctate, had a strongly ribbed posterior process, wider and more swollen hump with the two lobes very distinct. He sent three sketches which with his description leave little room for doubt that *molaris* is the burr oak species that has been called *dubiosa*. This species has been found in Ontario, northern Wisconsin and on Lake Superior in Minnesota. The burr oak goes as far west as Manitoba and probably the "Saskatchewan" of Butler's day also included the territory west of Ontario. The nymphs are extremely long and slender with two angular projections from the vertex a relatively low pronotum and a double row of long abdominal spines laying flat and shingled over each other. The

nymphal characters are so distinctly those of *Heliria* that there can be no question but what this species belongs here rather than in *Telamona*.

7. *Heliria clitella* Ball. Plate II, Fig. 16.

Heliria clitella Ball. Jl. Wash. Acad. Sc., XV: p. 201, 1925.

Telamona sinuata Van Duzee. Bul. Buff. Soc. N. S., IX, p. 69, 1908 (not Fowler).

Resembling *sinuata* but with a short oblique crest and short humeral angles. Length 11 mm., width 6 mm.

Pronotum long, low, striae only normally developed and not prominent at apex. Crest shorter than in *sinuata*, anterior and posterior margins almost parallel, sloping, anterior lobe pyramidal or rounding, the posterior lobe short, the angle acute, produced. Crest with two compressed areas, one along front margin and the other parallel with it. Just before the posterior margin these two troughs are separated by a very pronounced ridge that extends to the apex of the pyramid. Humeral angles very short and broad, rounding to just before the slightly acute apices.

Color. Grizzled gray, heavily mottled with dark, without definite pattern, a broad creamy stripe arising from just below the posterior angle of the crest and extending two-thirds of the way to apex of pronotum.

Habitat. The writer has taken it from the "blue" oak (*Quercus oblongifolia*) along the foothills of the Santa Rita Mountains, Arizona, in late April and May. A pair from the Huachuca Mountains, Arizona (Schaeffer, Brooklyn Mus.); a male from Arizona (Cornell coll.); and another example from Arizona (Woodruff Coll.).

The grizzled combination of ashy and sooty lines is exactly like that presented by the ridges of bark on the limbs of its host plant. The much shorter crest and acute posterior angle will at once separate it from *sinuata* which is found on the same host. The Cornell example is the one Van Duzee listed with some doubt as *sinuata*.

8. *Heliria gemma* Ball. Plate II, Fig. 17.

Telamona sinuata Funk. Hemip. Conn., p. 191, 1923 (not Fowler).

Heliria gemma Ball. Jl: Wash. Acad. Sc., XV, p. 202, 1925.

Resembling *fitchi* but paler and with a less definitely sinuated crest; crest intermediate between that of *fitchi* and *conca*. Large, female light creamy with brown mottlings,

males brown; hairy, crest long, broadly pyramidal with a posterior sinuation or step. Length, female 11 mm., width 5.5 mm., height 5.5 mm.; male, length 8-9 mm.

Pronotum long, acute, crest arising just back of the metapodial slope, anterior margin sloping insensibly into the outline of the rather large broadly rounding anterior lobe, posterior lobe short, sometimes almost merged into the posterior slope of the anterior one, usually represented by a slight step or sinuation, the posterior angle obtuse and the margins rounding into the posterior process. Humeral angles very broad, about right-angled, equaling or exceeding the breadth of the eye.

Color. Female, pale creamy, irregularly irrorate and mottled with brown, the brown mottling emphasized on the crest, along the oblique stripe and at the apex of pronotum. The creamy shade emphasized in a semi-circle beneath the crest on either side and in a band behind the crest which is connected with a definite white stripe on the posterior face of crest. The semi-circles are irregular along the margin, have brown mottling along the lower border and have a tooth of light pushed up into the anterior base of the crest. The males are densely hairy, almost uniform brown, with traces of the creamy tooth and the posterior stripe.

Habitat. The writer has examined examples from Vermont? (Barrett); Lancaster, New York (Van Duzee Coll., Ames); Catskills, New York (Olson); Adirondacks, New York (Barber); Catskills, New York (Drake); Mt. Katahdin, Maine (Barber); New Hampshire and Massachusetts (U. S. N. M.), and Toronto, Ontario (Davis, Royal Mus.), all taken in August and September and all from the higher mountain regions except the Lancaster and Ontario specimens. No food plant has been recorded. The color and markings would harmonize well with the large toothed aspen (*Populus grandidentata*) which is found in this general region. An example in the Uhler collection with the locality label faded out is marked *conca* Fh. Although undoubtedly a *Heliria* and closely related to *fitchi* and *conca* this is a very puzzling species. The pyramidal crest suggests the species of *Palonica*, while in the extreme hairiness of the males and the difference in shape and color of the sexes it resembles the group of species in *Telamona* that includes *decorata*. It is undoubtedly a representation of a primitive type and probably indicates the line of development of these groups.

9. *Heliria strombergi* Godg. Plate II, Fig. 18.

Heliria strombergi Godg. Bull. Ill. St. Lab. N. H., III, p. 423, 1894.

Resembling *Palonica pyramidata* var. *declivata* but larger and with much longer humeral angles and a smaller crest. Long, slender, crest low, with the anterior lobe an acute pyramid and the humeral angles extremely long and slender. Length 10 mm., width 7 mm., height 4.5 mm. Male, length 8 mm.

Pronotum long, slender, acute, crest long, low, the anterior lobe an acute pyramid, one-half higher than the horizontal posterior lobe, the posterior margin sloping into the pronotum. Anterior and posterior lobes independently inflated. Humeral angles strongly oblique, almost twice longer than wide, their apices bluntly rounding.

Color. Pale almost uniformly gray in the females; definitely marked with brown on metapodium and crest in the males.

Habitat. The writer has collected this species at Ames and Davenport, Iowa, and Rock Island, Illinois, and examined the Goding types (U. S. N. M.) from Galesburg, Ill. (Aug. 1-7, 1892, Stromberg), a series from Stromberg (Ill. Coll.), a female from Jacksonville, O., Aug. 1, 1898 (Osborn Coll.), as well as a pair from Dr. Drake's collection from Tupelo, Miss., July 1, 1921, and Lexington, Miss., August 16, 1921. Dr. Goding records this species from black willow and the writer's specimens from Davenport and Rock Island were from black willow. The writer collected this species in abundance at Ames one very foggy day in late July, 1897, but the notebook containing the host plant record has been lost. This is a very distinct species, probably southern in its distribution and reaching its northern limits in Central Iowa, Illinois and Ohio. The remarkable "ears" and acute anterior crest will at once distinguish it from all other species.

10. *Heliria scalaris* Fairm. Plate II, Fig. 19.

Thelia scalaris Fairmaire. Ann. Soc. Ent. Fr., Ser. 2, Vol. IV, p. 311, pl. 5, fig. 14, 1846.

Telamona fagi Emmons. Nat. Hist. N. Y. Agr., p. 154, pl. 3, fig. 10, 1854. (Not Fitch.)

Rich brown, crest large, anterior lobe knob-like, overhanging anteriorly. Length, female 9 mm., height 5 mm.

Pronotum rather broad and high, crest well back of metapodium, posterior lobe rectangular, slightly higher than wide, anterior lobe consisting of an elevated overhanging knob as

in *cristata*. Humeral angles triangular, the margins straight, equaling or slightly exceeding the width of eye.

Color. Uniform rich brown, rarely slightly speckled with pale on face, metapodium, knob and in a transverse band behind the crest. A short white line on the margin below the posterior lobe of crest.

Habitat. The writer has collected this species in some numbers from *Crataegus* at Ames, Iowa, and examined specimens from Kansas City (K. U. Coll.); Missouri (Uhler Coll., U. S. N. M.); Illinois-Stromberg (Ill. Coll.); Uhler, God. Coll., U. S. N. M.) (Titus); Minnesota (Minn. Coll.); Pine Island, N. Y. (Brooklyn Mus.); Pennsylvania (Bak. Coll. U. S. N. M.); Maryland (Phil. Acad.). The Ames examples were found most abundantly resting in rows on watersprouts that grew up through the head of hawthorn trees. They were intermingled in these rows with *Glossonotus turriculatus* and *G. crataegi*. Occasional examples have been taken resting on small branches near the outer margin of the tree. The Illinois example from Titus was taken from a wasp's nest.

H. s. var. *clivulata* nov. var. Plate II, Fig. 20.

Resembling typical *scalaris* but with a narrower and much higher crest. The anterior lobe is still knob-like but almost upright while the posterior lobe is very tall and narrow, its upper margin slightly sloping and its posterior face rounding into the curve of pronotum. Length 9 mm., height 6 mm.

Holotype, ♀, Little Rock, Iowa, August 2, 1919 (Ball), paratypes, 1 ♀, taken with holotype, 1 ♀, Winnebago Co., Minnesota, in Minnesota collection. 1 ♀, Brookings, South Dakota, July 11, 1923, in Osborn collection. The writer took his examples from an isolated thicket of wild plum. This may prove to be a distinct species when more material is available for study.

11. *Heliria praealta* Fowler.

Telamona praealta Fowler. Tr. Ent. Soc. Lond., p. 420, 1894.

Telamona turritella Buckton. Monog. Memb., p. 198, pl. 43, fig. 7, 1903.

Heliria rubidella Ball. Proc. Bio. Soc. Wash., 31, p. 28, 1918.

Heliria rubidella Yothers, Webster and Spuler. Jl. Econ. Ent., 22-269, 1929.

Smaller and paler than *scalaris* with an upright or sloping crest. Crest shaped like *sinuata* or *fitchi* but much shorter.

Humeral angles short and broad, about equaling the eye, the margin slightly rounding to the angular apex. Length female 9 mm., width 5 mm., height 5 mm. Length male 7 mm.

Fowler in 1894 described *T. praealta* from "Saguenay, Brazil (V. Huart), Belgium Museum collection." Later it developed that the specimens were sent the Belgian Museum by Canon V. Huard, of Quebec, who formerly resided at Saguenay, a town on a river of that name, 100 miles or more northeast of Quebec. The Canon was not able to give any information as to the food plant and kept no material. Only three species are known from that far north so *Palonica pyramidata*, *P. tremulata*, and *Heliria rubidella* were sent Mr. China, who reported that it was undoubtedly the same as *rubidella*. Buckton in his characteristic careless way redescribed the species as *turritella* from the same material used by Fowler. Mr. W. E. China informs me that one of Buckton's types has the label *Thelia praealta* still on it.

KEY TO THE VARIETIES OF *Praealta* (FEMALES)

- A. Dark mottled brown. Crest usually higher than its width.
 1. typical *praealta* Fowler.
 AA. Testaceous or pale brown with light mottling. Crest usually
 broader than its height 2. var. *rubidella* Ball.

Typical *praealta* Fowler. Plate II, Fig. 21.

Resembling *scalaris* but smaller and paler with a much narrower crest set well back of the metapodium, upright or slightly sloping, higher than its basal width, the anterior lobe upright, rounding above the posterior lobe, narrow, slightly sloping. The crest is narrower and higher than in var. *rubidella*.

Color. Dark dirty brown. In a few examples there are indications of a whitish "bloom" as in the var. *rubidella*. This species superficially resembles *Palonica pyramidata* var. *declivata* but is much smaller. The definite testaceous color and general structural character show an unmistakably close relationship to the *scalaris* group from which it was probably derived.

Prof. Cooley and the writer found this variety in abundance on the chokecherry (*Prunus melanocarpa*), in a canyon near Bozeman, Montana, July 27, 1923, and examples have been examined from Helena, Montana (Mann); Garland, Utah (U. S. N. M.), and Veta pass, Colorado, August 9, 1925 (Drake). M. A. Yothers sent a long series that were injuring apple trees at Wenatchee, Wash-

ington, June 30, 1930. The Quebec Province record indicates that it extends northward around the Great Lakes. The reference to *praealta* in the Van Duzee and Funkhouser Catalogs from "Pa." was based on an example of *Telamona concava* and that from "Fla." on an example of *Telonaca alta*.

Variety *rubidella* Ball. Plate II, Fig. 22.

Resembling *praealta* but much paler with a lower sloping crest with relatively little differentiation between the lobes; the dorsal margin sinuate and sloping rather than stepped, the posterior angle nearer a right angle than in *praealta*.

Color. Pale testaceous, a whitish "bloom" appears in mottlings on the metapodium, an oval extension below the crest and a transverse posterior band which connects with a light stripe on the posterior face of crest. Often the testaceous shades in to dark brown along the margin of the light areas, and the median carina may be dark brown and distinct in these areas. The males are much smaller and darker than the females and have very small and only slightly sinuate crests.

Habitat. The writer has taken this form in abundance from chokecherry in the mountains west of Fort Collins, Colorado, and a few from apple in his orchard at Logan, Utah, July 9, 1915, again in increasing numbers August 2, 1923, and in still greater numbers in August, 1928. Van Duzee records taking a variety of *scalaris* from chokecherry in the mountains of Colorado that was undoubtedly this species. The National Museum has an example from Bueno, Washington, and other examples from Colorado (Goding Coll.), LaVita, Colorado (Bak. Coll.), DeLong took it at Estes Park, Colorado.

5. Genus *Telonaca* Ball.

Telonaca Ball. Proc. Bio. Soc. Wash., 31, p. 27, 1918.

Resembling *Telamona* but with a slight sinuation or "step" on the posterior face of crest. Close to *Palonica* but in that genus the crest arises back of the metapodium. Crest broad, high, foliaceous at base, sometimes narrowing above; anterior margin, arising almost directly from the metapodium. Pronotum long, acute; humeral angles prominent, acute. The members of this group are intermediate in characters between *Heliria* on one hand and *Telamona* on the other. They might be placed in *Telamona* if it were not for the "step" character which at once sets them off as in reality quite distinct and more closely allied to *Heliria* and *Palonica*.

The nymphs are much like those of *Heliria* except that the projections on the head are smaller and there are only two pairs of very large spines on the abdomen.

Type of the genus *Telonaca ramona* Ball.

KEY TO THE SPECIES OF *Telonaca* (FEMALES)

- A. Humeral angles long and acute, much longer than eye. Species gray or mottled 1. *alta* Funk.
- AA. Humeral angles but little more than a right angle, about equaling the eye; species green 2. *ramona* Ball.

1. *Telonaca alta* Funk. Plate II, Fig. 23.

Telamona alta Funk. Ent. News, XXVI, p. 97, pl. 3, fig. 1 & 2, 1915.

Large, with an exceptionally high crest and acute humeral angles. Superficially resembling *Heliria mexicana* but with a much narrower and higher crest, resembling *Telamona colina* but with the crest much higher and possessed of a posterior "step." Length female 10.5 mm., width 7 mm., height 7 mm.

Pronotum broad, crest broad at base, very high equaling the width between the humeri, the anterior margin on a line with the metapodium. Apex broadly rounding, posterior margin slightly sloping with a distinct step and light area. Humeral angles long and acute, longer than their basal width, much longer than the eye.

Color. Pale yellowish, with fuscous mottling on the crest and slight indications of the usual oblique stripe and posterior band. The male differs from the female in the narrower crest, sometimes much narrower with a less definite step and less markings.

Habitat. W. E. Stone and the writer took nymphs and adults of this species from the turkey oak (*Quercus catesbaei* Mich.) growing on the high sandy ridges at Sanford and Clearmont, Florida. The nymphs appear in March and the adults in early April running on into May. Four other examples from Florida have been examined, a male, Tampa, May 22, 1908 (Van Duzee) and two females (Davis, Olson), 1 ♀ Gainesville (Weld). Funkhouser's type was a female from Spring Creek, Georgia, July 20, 1912. The nymphs resemble those of *Heliria gibberata* in general shape and anterior horn, but they have only the first two pairs of the abdominal spines developed.

2. *Telonaca ramona* Ball. Plate II, Fig. 24.

Telonaca ramona Ball. Proc. Bio. Soc. Wash. 31: p. 28, 1915.

Large, pale green, resembling *Telamona monticola* with a higher, variable but usually broadly pyramidal crest with a faint step. Length female, 10 mm., width 6 mm., height 6 mm.

Pronotum long and slender, crest pyramidal, very variable in width arising from the face of the metapodium with only a slight sinuation, sloping or occasionally upright in front. The whole crest may be narrowly pyramidal with a broad apex and a definite "step" on the posterior margin or much narrower, upright, with an acutely rounding apex and the "step" almost wanting. Humeral angles shorter than in *alta*, only slightly longer than the eye, the apices acutely angled, the anterior margins slightly rounding.

Color. Pale green fading to greenish-yellow in dried specimens, sometimes with a slight rufous cast, unmarked except for a single black spot above each eye.

Habitat. The writer has collected this species from oak at the mouth of a canyon, Pasadena, Cal., July 31. Prof. Hine took it in some numbers on oak in the foothills above Ontario, Cal., July 25. Examples have been examined from Los Angeles, Cal. (Coquillett, U. S. N. M.) and San Bernardino Co., California, in June (Van Dyke, Cal. A. S.) and females from the same place in September (Van Duzee, Cal. A. S.).

This species appears to be confined to a single species of oak growing in the lower parts of the canyons in southwestern California. The common form has the narrow crest with only a trace of a step while a rarer variety shows a much broader outline.

T. r. var. **pasadena** nov. var. Plate II, Fig. 25.

Resembling typical *ramona* in form and color but slightly smaller with a lower broadly pyramidal crest that is roundly truncated above and rarely shows the step.

Holotype ♀ Pomona, Cal. (Fall); allotype ♂ Ontario, Cal. July 25, '07 (Hine). Paratype ♀ San Diego, Cal. 7-4-27 (Davis). Paratype ♂ San Diego, Cal., 6-5/13 (Van Duzee). Two males and a female paratype Forest Home, San Berd. Co., Cal., June 12 and 14, 1928 (Van Dyke). The Ontario example was taken from oak with typical *ramona*. Holotype, allotype and one paratype in the author's collection, paratypes in Calif. Academy of Science.

6. Genus *Palonica* nov. gen.

Related to *Telonaca* in the variable crest and the posterior "step" but the crest is placed well behind the metapodium instead of arising as a continuation. Resembling *Telamona* but with a very variable pyramidal crest which in typical cases shows a sinuation or "step" that is lacking in that genus.

Pronotum extremely long and acute, usually slightly exceeding the elytra; crest placed well back of the humeral angles; anterior margin arising back of the metapodium, varying from obtusely to acutely pyramidal, sometimes in the same species but in typical examples showing a definite "step" or sinuation; humeral angles variable but not long and acute as in typical *Heliria* nor as rounding as in many *Telamona*.

Type of the Genus *Telamona pyramidata* Uhl.

When describing the genus *Telonaca*, the writer called attention to the relationship between *T. ramona* and *Telamona pyramidata* and suggested that *pyramidata*, except for its wide variability within the species, was probably more typical of the group than *ramona*. The discovery of additional species and a careful study of the probable lines of development lead to the conclusion that there are two separate groups represented, both possessing the "step" but in other characters quite distinct.

KEY TO THE SPECIES OF *Palonica* (FEMALES)

- A. Crest usually acutely pyramidal. Species creamy or gray-brown with dark brown markings.
 - B. Base of elytra not dark 1. *pyramidata* Uhler
 - BB. Base of elytra dark (Mexican) 2. *satyrus* Fowler
- AA. Crest broadly obtusely pyramidal. Species green or very dark.
 - C. Crest sinuate and with a definite posterior angle, species dark 3. *tremulata* Ball
 - CC. Crest very obtuse, almost symmetrical, species green.
 - 4. *viridia* Ball

1. *Palonica pyramidata* Uhl.

Telamona pyramidata Uhler. Wheeler's Rept. Chief Eng. for 1877, p. 1333.

Long, slender, the apical process very long, slender, exceeding the elytra, with a variable but usually acute pyramidal crest well back of metapodium. Humeral angles rather prominent, equaling the eye. The males are much smaller than the females.

Color. Yellowish or grayish, with irregular dark mottlings usually in the form of two variable stripes arising on the metapodium, uniting on the crest, and again separated by an angular white area which they border to the costa.

Habitat. The writer has taken this species in abundance on the black willow wherever he has collected. It is undoubtedly one of the most widely distributed of the treehoppers, occurring from Massachusetts to Oregon and from Saskatchewan, south to Louisiana. It is widely variable in size and color and especially in the size and shape of the crest. The following forms, worthy of varietal rank, are separated as follows:

KEY TO THE VARIETIES OF *P. pyramidata* (FEMALES)

- A. Crest narrow, upright, acutely angulate.
 - B. Large, grayish and obscurely mottled.
 - C. Crest narrow, tongue-like or acuminate, sinuation or "step" sub-obsolete 1. var. *pyramidata* Uhler
 - CC. Crest slightly broader and shorter with a definite step or sinuation on the posterior face.
 - 2. var. *declivata* Van Duzee
 - BB. Small, creamy with definite brown markings.
 - 3. var. *portola* nov. var.
- AA. Crest much lower and broader.
 - D. Crest nearly quadrangular, dorsum slightly oblique.
 - 4. var. *ampliata* nov. var.
 - DD. Crest very low with a long gentle slope from the metapodium and an abrupt upright posterior face.
 - 5. var. *nasuta* nov. var.
- 1. Typical *pyramidata* Uhler. Plate II, Fig. 26.

Large, yellowish, obscurely mottled with dusky, the males frequently shading to brown. Crest narrow, upright, placed well back of the metapodium, narrowing to an obtusely rounding apex, usually higher than its basal width and lacking any definite "step" on the posterior face. Length, female, 9-11 mm.; male 8 mm.

Habitat. The writer has collected this variety on the black willow in California, Colorado, Iowa, Illinois and Wisconsin and has examined examples from California (Van Duzee), Star City, Saskatchewan (Skinner); Washington (Osborn); Oregon (Van Duzee); Yellowstone Park, Wyoming (Minn.); Montana (Drake); North Dakota and Minnesota (Minn.); Kansas (DeLong, Kan.); Illinois Goding, U. S. N. M.); Albany, New York (N. Y. State); Cranberry Lake, New York (Osborn and Drake); Boston, Massachusetts (Morrison, U. S. N. M.); Louisiana (Baker, U. S. N. M.).

The type of this species is a male in the Uhler Collection (U. S. N. M.) labeled "S. Colo.," which has the typical narrow pyramidal crest.

2. Var. *declivata* Van Duzee. Plate II, Fig. 27.

Telamona declivata Van D. Bull. Buf. Soc. Nat. Se., IX, p. 64, 1898.

Resembling var. *pyramidata* in size and color, crest variable, not as tall and with a sinuation on the dorsum or a definite step on the posterior face.

Habitat. The writer has collected this variety on the black willow in Colorado, Utah, Iowa, Illinois, Wisconsin and District of Columbia and has examined examples from California (Osborn); Placerville County, California (Goding Coll., U. S. N. M.); Radisson, Saskatchewan (Skinner); Idaho (Osborn, Piper); Beaver, Utah (Brooklyn Mus.); Yellowstone Park, Wyoming; Northwest Nebraska (Barber); Missouri (Uhler, U. S. N. M.); Illinois (Titus); Toronto, Ontario (R. M. Ontario); Ithaca, New York (Cornell); Maryland and Virginia (Uhler, U. S. N. M.).

This is the most abundant form of the species and has occurred along with the typical *pyramidata* form wherever the writer has collected. The separation is purely arbitrary as there are all gradations, sometimes occurring on the same tree but in general the two forms are quite distinct and may be kept separate for purposes of defining the variations. The variety was described from four females, of which the writer has examined one in the Cornell collection and one in the Davis collection. These differ somewhat but both show the step or sinuation and both have higher crests than the average. Van Duzee in describing this as a species limited *pyramidata* Uhl. to the mountains of Colorado and this species to the eastern United States. In his Catalogue, however, he recognizes *declivata* from California. The writer has collected the different varieties of *pyramidata* in California, Utah, Colorado, Iowa, Wisconsin and the District of Columbia, and feels certain that there is but one widely variable species throughout the entire region.

3. Var. *portola* nov. var. Plate II, fig. 28.

Resembling var. *pyramidata* in form and structure except for the narrow, upright crest, scarcely tapering to the abruptly rounding and slightly sinuated to almost stepped apex.

Color. Pale, creamy, an irregular mottling on the humeri, the crest except the margins, an oblique stripe to the costa

and most of the apical process rich brown with white flecks. There is a definite extension of the yellow into the base of the brown marking on the crest on either side that is quite characteristic.

Holotype ♀ Quincy, Cal., July 23, allotype ♂ and three paratypes, Doyle, Calif., July 21, collected on black willow by the writer. One male, Billings, Montana, and a pair, Lake City, Cal., July 27, 1922 (Fox), the latter pair in the California Academy of Science.

This variety has a strikingly distinct color pattern but in other characters it varies towards the previous variety. It appears to be limited to the western mountain regions. All of the examples examined have been much smaller than typical *pyramidata*.

4. Var. **ampliata** nov. var. Plate II, fig. 29.

Resembling var. *declivata* but with a broader and more nearly quadrangular crest and less of the fuscous mottling. Crest broader than its height. Slightly sloping posteriorly, the anterior margins sloping to the metapodium with only a slight sinuation, the dorsum sloping posteriorly and definitely sinuated. The posterior angle right-angled.

Color. Pale tawny with a white line on posterior face of crest.

Holotype ♀ and allotype ♂, Josephine Co., Oregon, May 11, 1910. Paratypes 1 male, Osceola, Wis. (Ball); one female, Mont., two Yakima, Washington (U. S. N. M.), one Kaslo, Br. Columbia (Caudell and Currie, U. S. N. M.), one, male Mt. Tamalpais, Cal. (Van Duzee). Two examples in the Royal Museum, Ontario, from Edmondson, Alberta. This indicates an extreme northern and mountain distribution.

5. Var. **nasuta** nov. var. Plate II, fig. 30.

Resembling var. *declivata* but with a much lower and more sloping crest, resembling *T. viridia* in shape but the anterior slope of crest is longer and the crest is lower. Crest low, gradually rising from the slope of the metapodium and running in a straight line back to the low right-angled posterior angle or sometimes with a slight indication of the anterior angle, in which case the top of the crest is narrow and the slope to the metapodium is long and uniform.

Holotype ♀ and three paratype ♀♀, Davenport, Ia., Aug. 16, 1919 (Ball). Allotype ♂ and one paratype ♀, Ames, Ia. (Ball), one ♂, Ft. Collins, Colorado (Ball) and one Onaga, Kansas (Crevecoeur), one example Ill. (U. S. N. M.). All those collected by the writer were on black willow.

2. *Palonica satyrus* Fowl.

Telamona satyrus Fowler Biolog. Cent. Am. Homoptera, p. 145, pl. 9, fig. 9, 1896.

The writer has considered this a large and well marked variety of *pyramidata* and sent examples to China for comparison with the type. He writes that it is quite distinct from the example sent. "It is a larger and more robust species with different color pattern, the humeral lobes much more prominent, the metapodium more vertical less convex and (together with the head) covered with short erect bristles; the coriaceous base of tegmen fuscous."

Habitat. Known only from Guatemala.

3. *Palonica tremulata* Ball. Plate II, fig. 31.

Telamona barbata Funk., Biol. Memb. and Hemip. Conn. (not Van. D.).

Telonaca tremulata Ball, Jl. Wash. Acad. Sc. 15: 203, 1925.

Resembling *pyramidata* var. *declivata* and *ampliata*, slightly shorter, stouter, with a broader sloping sinuate crest and much darker pigmentation. Length female 9-10 mm., width 5.5 mm., height 5 mm. Length male 8 mm.

Pronotum stout, the apical process rarely as long as the elytra, with a long low pyramidal crest sloping from the metapodium to the anterior angle with a slight sinuation; anterior angle almost a right angle; top of crest long, sloping, concave, slightly sinuate, posterior angle obtuse, the posterior margin sloping slightly less than the anterior. Humeral angles prominent, similar to *pyramidata*, not as long as their basal width, scarcely equaling the eye in length, slightly acutely angular, the apex rounded.

Color. Variable, usually soiled yellow, so heavily irrorated and mottled with dark fuscous as to give a general dirty grizzled appearance with still darker areas on the crest and extending obliquely to the costa as well as at the apex. The males are usually darker, sometimes with a brownish shade. The Utah examples are pale creamy with definite dark markings in sharp contrast.

Habitat. The writer has collected this species in late July at Salem, New York; Osceola, Wisconsin; and Ephriam, Utah, all from quaking aspen (*Populus tremuloides*) and has taken nymphs that were undoubtedly this species in abundance from aspen at Little Beaver, Colorado. Other examples have been examined from Canada (Baker, U. S. N. M.); Kearney, N. J., on poplar; Bayfield, Wisconsin (Wickham, Barber) and Montana (Cooley).

Examination of specimens shows that this was the species reported by Osborn and Drake as *T. barbata* as occurring on aspen at Cranberry Lake, New York. The color of this species closely resembles that of the bark of an aspen at the base of the branches.

4. *Palonica viridia* Ball. Plate II, fig. 32.

Telamona viridia Ball, Proc. Bio. Soc. Wash., 16: p. 178, 1903.

Resembling *tremulata* in form but with a low pyramidal crest with a bluntly rounding apex. Females green. Length female 10–11 mm., width 5.5 mm., height 5 mm. Male length 9 mm.

Pronotum long, acute, crest wide, low, sloping about equally from both sides to the rounding apex which is much lower than the basal width, anterior margin sloping into metapodium as in *tremulata*. There is usually a slight situation on the posterior slope. Humeral angles shorter and blunter than in *pyramidata*, obtusely angled, the anterior margins rounding, the posterior margin inclined to be angled, especially in the male, giving an exceptionally "ear-like" appearance.

Color. Female pea-green, fading to yellowish in dried examples; male green or dirty yellowish with dark mottlings emphasized in a dark band running from the apex of crest obliquely to the costa.

Habitat. The writer has collected this species from the native cottonwood of the plains (*Populus deltoides*) in Denver and Greeley, Colorado, and Ames, Iowa, and has examined specimens from Las Vegas, New Mexico (Cockerell, U. S. N. M.); Arkansas (Bak., U. S. N. M.); Nebraska, Missouri and Illinois (Uhler, U. S. N. M.); Illinois (on cottonwood—Gerhart), South Dakota (Osborn); Ohio (on cottonwood—Osborn).

This species is apparently confined to this or closely related species of cottonwoods and is found on the smaller twigs low down in the head of the tree. They occur rather late in the season, the females sometimes as late as September, and at this time the terminal buds for the following year are about the same size and color as the females and the slightly angular outline of the outer scale often resembles the outline of the crest. Examples have been found at the base of trees during the winter, apparently hibernating, but as the writer has observed them laying eggs in the fall, these were probably late maturing individuals caught and chilled.

This is a strikingly distinct species in both form and color. Some of the darker males may superficially resemble the males of

tremulata except for the broad and obtuse humeral angles rather than the acute ones of that species.

7. Genus *Telamona* Fitch.

Telamona Fitch, Cat. Ins. of N. Y., p. 50, 1851.

Pronotum elongate, triangular, with a more or less quadrangular crest placed well back of the humeral angles, dorsum of crest usually horizontal or nearly so, sometimes sloping or sinuate but not definitely stepped and rarely showing a pale spot on the margin. Humeral angles variable, usually acute or rectangular.

Fitch erected this genus for the species with quadrangular crests but did not differentiate between this genus and *Heliria* of Stål. As restricted in this paper, in agreement with its type *ampelopsidis*, it represents a fairly homogenous group of moderately large, tree-inhabiting forms that can be distinguished by their large rectangular crests usually set well back on the dorsum.

The species as far as known are all single-brooded, the nymphs usually appearing in the northern region in May and June and the adults in July and August. The nymphs are fairly common on the smaller branches of the trees but are difficult to detect because they usually resemble the bark in both color and pattern. They are broad and rather flat, rarely showing any crest or spines until in the last nymphal stage a slight anterior protuberance appears on the dorsum.

KEY TO THE SPECIES OF *Telamona* (FEMALES)

- A. Crest very large, quadrangular, often slightly overhanging the metapodium, humeral angles usually prominent, acute.
- B. Humeral angles often long and acute, longer than the eye.
- C. Species plain or sparsely ornamented, crest not constricted.
- D. Humeral angles longer than the basal width, nearly twice the length of the eye. Species plain or with a pair of spots.
- E. A pair of black spots on costa.....1. *maculata* V. D.
- EE. Without definite black markings.....2. *collina* Walk.
- DD. Humeral angles not longer than their basal width, a wavy oblique line on crest or entirely dark.
- 3. *ampelopsidis* Harr.
- CC. Species ornamented, crest constricted, then widening at apex.
- F. Species small (8 mm. or less), crest almost over the metapodium, dorsum only slightly sinuate.... 4. *tristis* Fh.

- FF. Species large (10 mm.), crest definitely back of metapodium, dorsum strongly sinuate 5. *concava* Fh.
- BB. Humeral angles shorter, right-angled or obtuse.
- G. Crest upright in front, species brown..... 6. *extrema* Ball
- GG. Crest sloping back from metapodium.
- H. Female extremely large, green, anterior angle of crest distinct (♂ fasciate) 7. *unicolor* Fh.
- HH. Female smaller, brownish, anterior angle of crest rounding.
- I. Crest very broad much broader than high (Fla.).
8. *dorana* n. sp.
- II. Crest about equally broad and high (S. Calif.).
9. *coronata* n. sp.
- AA. Crest smaller, often rounding, where quadrangular, placed well back on pronotum. Humeral angles rarely prominent.
- J. Crest arising well back on pronotum, usually abruptly; as high or higher than its median breadth or quadrangular and about equal.
- K. Species large (females 10 mm. or more). Crests narrowing from both margins, inclined posteriorly and obliquely truncate.
- L. Female pale green with a coppery cast, and maculate with small creamy spots..... 10. *monticola* Fab.
- LL. Female pale dirty yellow or greenish with dark markings.
- M. A greenish cast, crest definitely higher in front, dark, the dorsal margins brown..... 11. *tiliae* Ball
- MM. Dirty yellow, crest level or slightly sloping, obscurely fuscous, dorsal margin lighter.
12. *spretta* Godg.
- KK. Species smaller, crests upright.
- N. Crest upright or slightly pyramidal.
- O. Crest upright, dorsum oblique 13. *gibbera* Ball
- OO. Crest pyramidal, dorsum oval 14. *tarda* Ball
- NN. Crest low, quadrangular, species small and compact.
- P. Crest as high as its median width, greenish-yellow with a dark apex 15. *decorata* Ball
- PP. Crest slightly broader than high, species reddish-brown.
- Q. Cinnamon brown, scarcely marked, crest evenly inflated 16. *woodruffi* Ball
- QQ. Reddish brown with irregular creamy spots, crest with two inflated areas 17. *compacta* Ball
- JJ. Crest rounding or sloping from the metapodium without a definite angle broader than high, often much broader.

R. Crest very low, the posterior angle rounding or obsolete.
18. *wescotti* Godg.

RR. Crest with the posterior angle prominent, often acute.

S. Crest about twice as long as high, posterior angle acutely produced. (Atlantic and Gulf coasts). 19. *salvini* Dist.

SS. Crest higher, not twice as long as high, posterior angle not produced into a spine.

T. Crest low, longer than high, anterior base compressed, male crest obscure. (East of Rockies). 20. *reclivata* Fh.

TT. Crest higher and more oblique, anterior angle often obscure, anterior base inflated. Male similar to female. (Pacific Coast)..... 21. *vestita* Ball

1. *Telamona maculata* V. D. Plate 3, fig. 33.

Telamona maculata V. D., Buff Soc. N. S., Vol. IX; p. 72, pl. 2, figs. 8, and 41, 1919.

Telamona lugubris Funk., Hemip. Conn., p. 188, 1923. (Not Ball).

Resembling *ampelopsidis* but with longer humeral angles and a broader crest. Length female, 10–11 mm.; width, 7 mm.; height, 6 mm.

Pronotum long, acute; crest broad, quadrangular, half longer than its height; anterior margin upright, arising just back of the line of the metapodium; anterior angle broadly rounded, dorsum slightly sloping posteriorly with the posterior angle slightly obtuse. Humeral angles extremely long, constricted at base, then slowly tapering to the blunt apices, nearly twice the length of the eye.

Color. Dirty straw-yellow with a trace of greenish, often a chestnut cloud on the anterior part of crest and rarely an interrupted band across the metapodium. There is usually a definite black mark on the costa just back of the crest extending down on to the nervures of the elytra.

Habitat. The writer has collected this species in Iowa, Minnesota and Wisconsin on the burr oak and has examined examples from Nebraska (Pierce), Missouri (Uhl, U. S. N. M.), Illinois, (Stromberg, Ill.), (Gerhart), Pennsylvania (DeLong), and Long Island (Davis).

2. *Telamona collina* Walk. Plate III, fig. 34.

Thelia collina Walk., List Homop. B. M., p. 565, 1851.

Telamona pruinosa Ball, Proc. Bio. Soc. Wash. Vol. 16, p. 177, pl. 1, fig. 7, 1903.

Telamona collina Funk., An. Ent. Soc. Am. 16, p. 109, pl. 4, fig. 6, 1923.

Resembling *ampelopsidis* and *maculata* but paler with a pruinose tinge and a sloping crest. Length female, 10-11 mm., width 6 mm., height 6 mm.

Pronotum as in *ampelopsidis*.-crest higher in front and definitely sloping posteriorly to a weak posterior angle. The anterior margin of crest sloping back from metapodium or upright just before the apex, crest about the size of *maculata* but not as definitely quadrangular. Humeral angles longer and slenderer than in *ampelopsidis*, much shorter than in *maculata*, with a slight basal constriction.

Color. Pale cinnamon, with greenish and yellowish tinges, resembling the fresh bark of the sycamore with the bloom on. The metapodium is usually creamy with two cinnamon clouds above, while there may be traces of the rusty line of *ampelopsidis*.

Habitat. The writer has collected adults and nymphs of this species on the sycamore in Iowa, Illinois and the District of Columbia and nymphs in Ohio and has examined examples from Kansas (K. U.), Missouri (Uhl, U. S. N. M.), Illinois (Gerhart), Ohio, Pennsylvania (Phila. Acad.), New York (Cornell and K. U.), Long Island (Davis), Maryland and Virginia (Uhl, U. S. N. M.). The type was from New York.

The nymphs are usually found on small limbs resting at the base of a leaf where they are almost indistinguishable from the branch in color and form. The color of the adults is almost identical with that of the fresh bark of the smaller limbs where they rest. They are usually found on the outer and lower limbs of old trees or in the tops of very small ones.

Funkhouser states that *pruinosa* Ball is a synonym of *collina* Walk. and gives two figures of the type drawn by Knight. One of these shows the humeral angles as extending beyond the eyes for more than twice the length of the eye which if correctly drawn would make it certain that *maculata* V. D. and not *pruinosa* Ball was the synonym as that is the only *Telamona* that has that character. The writer sent examples of both species to China for comparison with the type. He inclined to the belief that *pruinosa* was closer to the type but based his opinion largely on the shape of the crest and the absence of the black spot. Neither character is however definite, as Wm. T. Davis has an undoubted *maculata* from Long Island with a crest like China shows in his drawing of the type and the black spot varies in size and intensity and may have faded out on the type. He sent three drawings. The side view was quite different from that of Knight in showing a lower and

more evenly rounding crest and the face view showed humeral angles shorter than in Knight's figure but still longer than in *pruinosa*.

It will take a direct comparison by some one familiar with the variations in the two species to make a final determination so the writer has allowed this reference to stand.

3. *Telamona ampelopsidis* Harr. Plate III, fig. 35.

Membracis ampelopsidis Harris, Rept. Inst. Mass., p. 180, 1841.

Thelia cyrtops Fairm., Rev. Membr., p. 310, pl. 5, fig. 13, 1846.

Hemiptycha diffusa Walk., List Homop. B. M. Supp. p. 143, 1858.

Form of *pruinosa* nearly, crest slightly more rectangular, pale tawny, with an irregular, oblique brown line. Length 10 mm., width 6 mm., height 5.5 mm.

Pronotum with a large, almost quadrangular, crest arising just back of the line of the metapodium. Crest slightly longer than high, anterior and posterior margins varying from slightly sloping to upright or even slightly constricted at base, dorsum sloping as in *maculata*. Humeral angles long, acute, slightly longer than the eye, broader and shorter than in *maculata*.

Color. Grayish or pale creamy, with a tawny cast, an interrupted brown band across metapodium from the humeral angles, crest pale brown with an oblique stripe to costa. The lower margin emphasized into an irregular oblique line, broken upwards below the crest. The males are often much darker, occasionally almost black.

Habitat. The writer has collected this species, larva and adult, on the woodbine (*Ampelopsidis quinquefolia*) in Colorado, Iowa, Wisconsin, and Massachusetts, and has examined examples from Montana (Uhler), Nebraska (Pierce), Missouri (U. S. N. M.), South Dakota (Osborn), Illinois (Gerhardt), Indiana (U. S. N. M.), Ohio (Gossard), Kansas (K. U.), Pennsylvania (Warren), New York (all coll.), Ontario (Ont.), New Hampshire (U. S. N. M.), Maine (Bartlett, U. S. N. M.), Massachusetts (Boston Soc. N. H.), Rhode Island (U. S. N. M.), Connecticut (Conn.), New Jersey (Davis), Maryland (McAtee), Virginia and D. C. (Davis), North Carolina and Texas (U. S. N. M.).

Funkhouser reported the type of *diffusa* Walker as lost but recognized it as a distinct species of *Telamona* which he figured and lists in his catalogue. Mr. W. E. China found the type and

sent three drawings showing shape, venation and markings. From these it is evident that it is only the small dark marked form of *ampelopsidis* that occurs commonly in the North. Funkhouser's specimen was undoubtedly the same thing. Funkhouser calls attention to Van Duzee's error in placing this species as a synonym of *unicolor* but allows the same reference to stand on p. 259 of his catalogue.

Telamona ampelopsidis var. **tigrina** nov. var. Plate III, fig. 36.

Resembling *ampelopsidis* in size and general markings but with a lower and more rounding crest with the posterior angle almost obsolete. The crest is slightly more sloping in front than in the species, with a more rounding dorsum and the posterior slope extend from the crest far back on to the process without a definite posterior angle. Color pale straw without definite brown markings on crest except a number of fine but irregular and interrupted oblique lines. Length ♀, 11 mm.

Holotype ♀, April 26, 1907, Dallas, Texas. Two paratype females from the same place May 1, 1907.

4. *Telamona tristis* Fh. Plate III, fig. 37.

Telamona tristis Fitch. Cat. Ins. N. Y., p. 51, 1851.

Telamona coryli Fitch. Cat. Ins. N. Y., p. 51, 1851.

Telamona spreta of Van D. and Funk. (Not Godg.).

Small with a large quadrangular crest as in *concaeva*, resembling *ampelopsidis* but much smaller and more fragile. Length ♀, 8.5 mm., width 5 mm., height 5 mm.

Pronotum low and relatively short and blunt, shorter than the elytra, crest quadrangular, slightly longer than its height, definitely constricted at the base, the anterior margin not quite equalling the metapodium, dorsal margin slightly sinuate. Humeral angles right-angled or slightly acute, slightly exceeding the eye.

KEY TO THE VARIETIES OF *T. tristis*

- A. Crest tawny or marbled with brown and white.
 B. Crest tawny.1. *jucunda* nov. var.
 BB. Crest marbled with brown and white.2. *tristis* Fh.
 AA. Crest with a broad, median white band margined with dark brown.3. *coryli* Fh.
 1. Variety **jucunda** nov. var.

Resembling typical *tristis* in size and structure.

Color. Pale tawny, sometimes with faint indications of white mottling in the female. Male tawny with a narrow

interrupted transverse band across the crest, broadly margined with tawny and narrow stripe on posterior margin of crest.

Holotype ♀, allotype ♀ and 3 pairs of paratypes, Osceola, Wisconsin (Ball) and three ♀♀ Onaga, Kansas (Crevecoeur). The writer collected his material from hazel brush (*Corylis americana*).

2. Var. *tristis* Fitch

Form and structure of the species.

Color. Dark brown or fuscous, mottled with paler spots, usually a definite white spot on anterior and posterior base of crest and a pair of spots on the dorsal margin. Sometimes the pattern of *coryli* is faintly outlined but obscured by the dark mottling.

Taken by the writer on hazel brush and ironwood in Iowa and Wisconsin and examples have been examined from Iowa (Knight on ironwood), Kansas (Crevecoeur), Missouri (K. U.), Illinois (Uhl., U. S. N. M.), Michigan (Hungerford, K. U.), Pennsylvania (DeLong), Ontario (U. S. N. M.), New York, (Fitch, Albany) (Davis), New Jersey (Davis), Connecticut (Conn.), Massachusetts and Vermont (B. S. N. H.), Maryland, West Virginia, and Florida (U. S. N. M.). Males of this variety are very rare; possibly all males are similar in color pattern.

3. Var. *coryli* Fitch

Form and structure of the species.

Color. Dark brown, mottled, with a broad white band occupying the entire crest except the anterior and posterior margins, and extending down the margin of pronotum; a small white spot on the anterior base of crest and a broad stripe on posterior face. The white band is often constricted at the base of the crest and there are usually brown mottlings along the edge of pronotum.

Taken by the writer on hazel brush and ironwood (*Ostrya*) with the preceding varieties in Iowa and Wisconsin and specimens have been examined by Iowa (Knight on ironwood), Kansas (Crevecoeur), Missouri (K. U.), Minnesota (U. S. N. M.), Illinois (Gerhart), Michigan (Hebard, Phil. Acad.), Pennsylvania (DeLong), Massachusetts (B. S. N. H.), New York (Fitch, Albany), Ontario (V. D., U. S. N. M.). Most of the males taken belong to this variety.

5. *Telamona concava* Fitch. Plate III, fig. 38.

Telamona concava Fitch. Homop, N. Y. St. Cab., p. 50, 1851.

Telamona ornata Emm. Nat. Hist. N. Y. Agr., p. 155, pl. 3, fig. 8, 1854.

Resembling *pruinosa* but with a high quadrangular crest. A small compact species with an almost square crest, sinuate above, a definite color pattern as in *Glossonotus crataegi*. Length 10 mm., width 6 mm., height 6 mm.

Pronotum relatively short and stout, crest well back of metapodium, tall, almost square, with the anterior angle broadly rounding, the posterior rectangular, slightly lower, dorsum concave. In some examples the crest is slightly inclined backwards with both faces parallel. Humeral angles almost equilaterally triangular or the margins a trifle rounding.

Color. Dark brown, irrorate, with the metapodium paler, a definite light crescent below the crest, a transverse band well back of crest extending forward on the median line to the crest, and a small semi-circular spot in the concavity of the crest, light. The dark areas are emphasized against the light markings, the lateral crescents extend in the form of oval spots into the base of the crest and often there is a connection between the crescent and the light area back of the crest.

Habitat. The writer has collected this species at Amery, Wis., and has examined examples from Michigan (Phil. Acad.); West Ohio and Bayfield, Wis. (Osborn Coll.); Illinois (Uhler Coll., U. S. N. M.); New York, (Fitch, Albany and U. S. N. M.; Woodruff); Chicopee, Mass. (Baker Coll., U. S. N. M.); Broad Top Mountain, Pa. (Phil. Acad.); Pennsylvania (Van Duzee). As far as present records go it appears to be northern in distribution. This species is very rare in collections and no host plant is known. The writer has examined the unique Fitch type (No. 686) in the State Cabinet at Albany and finds that it agrees with the description given by Fitch and also with the figure and description of *ornata* Emm. Emmons remarks that the color pattern of *ornata* resembles *G. crataegi*, which is the most distinctive character of this species. Fitch evidently had examples of both *concava* and *Heliria fitchi* in his collection but did not recognize them as distinct. When he came to select an example to describe and place in the State Cabinet he took the most definitely marked one, probably leaving in his own collection only examples of *fitchi* but labeled *concava*. This may explain why Emmons redescribed the species. The reference to *praealta* from Pennsylvania in the Van Duzee Catalogue was from an example of *concava* erroneously determined.

6. *Telamona extrema* Ball. Plate III, fig. 39.

Telamona extrema Ball, Proc. Bio. Soc. Wash. 16: p. 179, pl. 1, fig. 1, 1903.

Resembling *maculata* and *pruinosa* in size and form but with much shorter humeral angles and a larger, broader crest. Pale testaceous brown. Length ♀, 9 mm., width 5 mm., height 5.5 mm.

Pronotum relatively short and obtuse posteriorly, crest large, upright, longer than high, almost uniform in height, the anterior margin upright, arising on the line of the metapodium or nearly so. Dorsal margin convex, posterior margin very slightly sloping. Humeral angles roundly right-angled, about equalling the eye.

Color. Uniform rich, testaceous brown, darkened a little on the dorsum of crest and narrowly margining a creamy white stripe on the posterior face of crest. The disc of the metapodium often has a greenish tinge.

Habitat. The writer has collected this species on the black oak in Iowa and Wisconsin, and has examined examples from Illinois (Godg., U. S. N. M.), Indiana (Gerhart), Pennsylvania (DeLong), New York (Woodruff, N. Y. S.), New Jersey (Davis), Long Island (Olson), Massachusetts (B. S. N. H.), West Virginia (Davis), Virginia (Phil. Acad.), Maryland (Uhl., U. S. N. M.), Alabama (Woodruff), Clayton, Ga. (Davis).

This is a strikingly distinct and easily recognized species by its large quadrangular crest and its uniform color. Examples of this species with the broadest crests approach the outline of an *Archasia* and suggests the line of development of this group.

7. *Telamona unicolor* Fitch. Plate III, fig. 40.

Telamona unicolor Fh. Cat. Ins. N. Y., p. 50, 1851. ♀

Telamona fasciata Fh. Cat. Ins. N. Y., p. 50, 1851. ♂

Resembling *ampelopsidis* in form but larger; female bright green, male straw color with dusky bands. Length female, 12 mm., width 6 mm., height 6 mm.

Pronotum strong, acute, crest broad and high, arising just back of the curve of the metapodium; anterior and posterior margins sloping, dorsal margin weakly convex and slightly inclined posteriorly; humeral angles broad, rounding, slightly obtusely angled, about equaling the eye.

Color. Female deep green in life fading to straw color in dried specimens. Base and apex of elytra fuscous. Male straw color, metapodium and anterior margin of crest mottled with brown, an oblique band near the posterior margin of crest, smoky brown.

Habitat. The writer has taken this species abundantly on hickory, black walnut and butternut in Iowa, Wisconsin, and Toronto, Can. Specimens have been examined from Arkansas (McElfresh), Kansas (DeLong), Missouri (K. U.), Michigan (Uhler, U. S. N. M.), Illinois (Gerhart), Ohio and Pennsylvania (DeLong) New York and Ontario (Albany), New Jersey (Phil. Acad.), Connecticut (Conn.), Massachusetts (B. S. N. H.), and Brownsville, Tex. (U. S. N. M.).

This is the largest species in the group and is strikingly distinct in the different color of the sexes. The nymphs have been taken abundantly on hickory and butternut. They are smooth bodied and resemble the bark of the smaller twigs in color and when resting in the shadow of some branch they are difficult to detect. The adults rest near the tips of the twigs where the green of the leaves protects them. Fitch described a variety of this species as *irrorata* which he said occurred on walnut but was very rare. From the description he evidently had a broad crested form of *monticola* in hand.

8. *Telamona dorana* n. sp. Plate III, fig. 41.

Resembling *monticola* in form and color but with a much longer crest and more acute humerals. Brown irrorate with white points. Length ♀ 11 mm., ♂ 10 mm., width 6.5 mm.

Crest extremely long fully one-half the length of the pronotum arising from the convex metapodium in front and slightly sloping to the rounding anterior angle. Top broad and broadly rounding or slightly sloping posteriorly to the definite but slightly obtuse posterior angle. Crest as long at base as in *extrema* but not as broad at apex the posterior margin with the same slope. Humeral angles slightly more acute than in *monticola*, about as in *extrema*. The crest is definitely more inflated than in *extrema* but not uniformly so as in *monticola*.

Color. Pale testaceous brown sprinkled with white points and with a white stripe on the posterior face of crest. Male darker brown with the white stripe broadened and emphasized.

Holotype ♀, allotype ♂ and 9 paratypes taken by W. E. Stone and the writer at Sanford, Florida, April 3, 1927; one female, Ocala, Florida, April 29, 1928; three males Mt. Dora, March 27, 1927, and one paratype female, Monticello, Florida, April 12, 1913 (Gill, U. S. N. M.). Nothing but males were taken March 27. On April 3 there were males, a few females and large nymphs which matured two days later. They were all taken on the turkey oak

(*Q. catesbaei*). The stout smooth nymphs were on limbs about the size of a lead pencil and resting in the angle of a branch.

Telamona extrema, *dorana*, *coronata* and *monticola* form a descending series in position and length of crest. They are however distinct species with definite characters, different food plants and distinct distribution.

9. *Telamona coronata* n. sp. Plate III, fig. 42.

Resembling *dorana* but smaller, paler, with a shorter and more angular crest, that is higher in front and sinuate dorsally. Length 9 mm., width 5 mm.

Crest arising in the line of the metapodium with only a slight slope, proportionally higher and more foliaceous than in *dorana*. The anterior portion highest, the angle narrowly rounding, dorsal line slightly sloping posteriorly and definitely sinuated, the posterior angle thereby emphasized and approaching a right angle. Humeral angles longer than in *dorana*, slightly acute.

Color. Pale greenish brown. The brown emphasized on the margins, no pale spots but the posterior margin of crest is light. Holotype ♂, June 5, 1913, San Diego Co., Calif. (Van Duzee), allotype ♀, October 20, 1913, San Diego Co., Calif., and one paratype female taken with the type. Holotype and paratype in collection of the Calif. Acad. Sciences. Allotype in collection of the writer.

This is a distinct little species with a much longer and more upright crest than in *monticola*, much sharper humeral angles and it lacks the bulge in the metapodium of *dorana*. No food plant is recorded but it was taken the same day as an example of *Telonaca romona* which has the same color and they may well occur on the same oak.

10. *Telamona monticola* Fabr. Plate III, fig. 43.

Membracis monticola Fabr., Syst. Rhyn., 7, No. 4, 1803.

Telamona querci Fitch, Homop. N. Y. St. Cab., p. 51, 1851.

Telamona brunneipennis Buckton, Mong. Memb., p. 197, 1903.

Telamona unicolor var. *irrorata* Fh., 3d. Rep. p. 450, 1856.

Telamona celsa Godg. Am. Mus. Nov. No. 421, p. 21, 1930.

A large greenish-brown species, irrorate with small white spots. Crest set well back, about equal in height and width. Length female, 10 mm., width 6 mm., height 5 mm.

Pronotum short, broad and bluntly pointed at apex; crest almost quadrangular, inclined posteriorly; anterior margin sloping concavely into the curve of metapodium; dorsal margin convex, inclined posteriorly; posterior margin about

upright. Humeral angles broad, right-angled, about equaling eye. Lateral carinae obscure.

Color. Mottled brown and green, irrorate with light points and washed with a coppery reflection. The posterior face of the crest broadly white. The males are often smoky with only faint traces of the green.

Habitat. The writer has taken both nymphs and adults abundantly on the white oak with occasional captures on the bur and black oaks in Iowa, Wisconsin, District of Columbia, Virginia and Massachusetts and has examined examples from Manitoba (U. S. N. M.); Arkansas (McElfresh); Kansas (DeLong); Nebraska (Pierce), Missouri (K. U.); Illinois (Ill., Wescott); Michigan (Olsen); Indiana (Baker, U. S. N. M.), New York (Fitch, Albany); Ontario (Ont.); Pennsylvania (DeLong); Massachusetts (Titus); New Hampshire (Slosson); Vermont (B. S. N. H.); New Jersey (A. M. N. H.); Maryland (Barber); North Carolina (Sherman); Georgia (Davis); Alabama (Woodruff); Jacksonville, Fla., and Texas (U. S. N. M.).

This is one of the most abundant and easily recognized species of the group. In general outline it resembles *spreti* but is quite distinct in color. The writer has examined the Fitch type at Albany and there is no question about the species. Fairmaire's description of *monticola* was of course from an old specimen in which the green color had faded, but his mention of the broad, white stripe on the posterior face of crest would eliminate any other species that the outline would fit. It was probably described from a male in which the color is darker and the white stripe broader. Buckton's description and figure of *brunneipennis* are as usual very poor, but there can be but little question that he was also dealing with a male of this species. Fitch's description of *unicolor* var. *irrorata* was evidently based on females of this species which were accidental on walnut and therefore rare as he suggests.

Goding recently described *Telamona celsa* from Brazil. The type is in the American Museum collection and through the kindness of Dr. Lutz, Mr. C. E. Olesen has carefully compared it with examples of *querci* and reports that there is no character by which it could be separated. The eggs of this species pass the winter in oak twigs and it has no doubt been introduced into Brazil in nursery stock or arboretum material. A common European treehopper has been recently established in New Jersey in this same way.

Examples previously determined as *monticola* from central or southern Florida will probably prove to be *dorana* and, from California, *vestita* or *coronata*.

11. *Telamona tiliae* Ball. Plate III, fig. 44.

Telamona reclinata of Goding, Van Duzee and Funkhouser (not Fitch).

Telamona decorata Funkhouser, Bio. of the Memb., p. 264, plate 27, fig. 11, 1917 (not Ball).

Telamona tiliae Ball, Jl. Wash. Acad. Sc., XV, p. 203, 1925.

Intermediate between *spretata* and *reclinata* in outline, resembling *spretata* but with definite dark markings especially in the male. Length female, 10 mm., width 6 mm., height 5 mm.

Pronotum long, acute, crest broad, quadrangular, inclined posteriorly, the anterior margin sloping from middle of metapodium to middle of crest, crest obliquely truncate, the anterior angle roundly rectangular, the posterior one obtuse, posterior margin upright, rounding into pronotum below. Humeral angles slightly obtusely angular, their margins curved, almost equalling the eye.

Color. Dirty grayish-green, fading to dirty yellowish, with most of the crest and an oblique strip to costa brown; in the females this brown area may only be emphasized on the margin but in the males it is broad and definite, a broad light stripe on anterior and posterior margins of crest.

Habitat. The writer has collected this species, both nymphs and adults, in abundance on basswood in Iowa, Wisconsin, and Ontario, and has examined examples from Minnesota (Baker, U. S. N. M.); Illinois (Wescott); Michigan (Bak., U. S. N. M.); Ohio (DeLong); Pennsylvania (Olson); New York (Albany), Ithaca, New York (K. U.); Pennsylvania (Olson); Ontario (K. U.); Massachusetts (B. S. N. H.); Connecticut (Uhl, U. S. N. M.); New Hampshire (Slosson).

This common basswood species has been almost universally determined as *reclinata* but the Fitch type at Albany shows the rounded anterior crest, as well as the other characters Fitch mentions in his description that make it certain that he was describing the much smaller oak species, as he stated. Funkhouser in his Biology of the *Membracidae* figures a strongly marked male of this species as *decorata* Ball and lists linden as a host. He probably did not have true *decorata* as he also records *barbata* from linden.

12. *Telamona spretata* Goding. Plate III, fig. 45.

Telamona spretata Godg., Cat. Membr. N. A., p. 417, 1894.

Telamona lugubris Ball, Bio. Soc. Wash., XVI, p. 179, 1903.

Superficially resembling *tiliae* but still larger and lacking the green and black contrast of that species. Length female, 11 mm., width 6 mm., height 5 mm.

Pronotum long, acute, lateral carinae obscure, crest as in *tiliae* or a little farther back with a longer anterior slope and a right-angled or often slightly acute posterior angle. Humeral angles as long as the eye, about right-angled, the margins rounding.

Color. Dirty brownish straw, with obscure markings on crest and an oblique band. These are sometimes almost wanting and again quite definite but not definitely black in color as in *tiliae*.

Habitat. The writer has taken this species, both nymphs and adults, commonly on the burr oak in Iowa, Minnesota and Wisconsin, and has examined examples from South Dakota (Knight), Illinois (Godg., U. S. N. M.), (Ill.), Michigan (U. S. N. M.) and Central Park, New York City (Davis). It no doubt occurs in the intermediate region but has not been recognized as a distinct species in collections.

Goding many years ago determined and distributed a number of different examples of *ampelopsidis* as his *spretta* with the result that *spretta* has been considered by every one as a synonym of that species. The writer, having Goding's erroneous determination in his collection, described this species as new. A study of the type, however, leaves no room for doubt that it was the burr oak species that Goding originally described. This species is much closer to *tiliae* in general appearance than to *ampelopsidis* and dried and faded specimens are sometimes separated with difficulty. The smaller size more definite green and black markings and shorter crest will ordinarily differentiate *tiliae*. The nymphs of this species have a double row of curved spines down the abdomen while most *Telamona* nymphs are smooth.

Telamona spreta var. **agrandata** nov. var. Plate III, fig. 46.

The writer has in his collection four female examples of what appears to be a variety of this species. They resemble typical *spretta* in color and ornamentation but are slightly larger, longer, with the humeral angles slightly longer and more acute and the crests placed well back and not sloping to the metapodium, while the dorsal margin is definitely sinuate, the anterior half rounding while the posterior half is slightly lower and straight or concave as in *concaua*.

Holotype ♀, Madison, Wisconsin, June 16, 1918; paratypes one ♀ from Ames, Iowa, two ♀♀ Spirit Lake, Ia., August 1, 1919, all

collected by the writer. The Ames female had mated with a male *tiliae* but was not able to release the claspers and was captured by hand. This may prove to be a distinct species when more material is available for study. One example was taken on white oak and one on burr oak but both may have been accidental resting places.

13. *Telamona gibbera* Ball. Plate IV, fig. 47.

Telamona gibbera Ball, Jl. Wash. Acad. Sci., XV, p. 204, 1925.

Resembling *tiliae* but smaller and more definitely marked in the male. Slightly larger than *reclivata* with a taller, narrower and more definitely upright crest. Length female, 9 mm., width 5 mm., height 6 mm., length male 8 mm.

Pronotum low, rather broad with a narrow upright crest arising well back of the metapodium. Crest narrow, high with the anterior margin vertical and in line with the lateral angles; dorsum obliquely rounding, highest just back of the anterior margin and sloping down to the obtuse posterior angle, posterior margin slightly sloping and rounding into the broad apical portion; humeral angles broad, almost right angles, equaling the eyes, resembling *tiliae*. Male slightly smaller than the female with the crest lower, rounding, sloping equally from both front and back.

Color. Female dirty gray, irrorate, slightly darkened around the margin of crest and set off by a white stripe on the posterior slope. Male highly and strikingly ornamented as follows: Face and metapodium irregularly mottled with brown; crest heavily margined with dark brown with occasional light spots, a creamy area below the crest on either side which sends up a narrow yellow stripe into the dark of the crest, anterior carinae narrowly light and posterior slope broadly so.

Habitat. The writer has taken this species on *Quercus utahensis* in Long Valley, Arizona in August and has examined numerous examples from the higher elevations in Arizona where this species of oak grows, (Knight) (Wickham, Cal. Acad. Sc.—Ames) (Barber and Schwarz, U. S. N. M.) and Cloudercroft, N. M. (Wickham, Cal. Acad. Sc.).

14. *Telamona tarda* Ball. Plate IV, fig. 48.

Telamona tarda Ball, Jl. Wash. Acad. Sc., XV, p. 204, 1925.

Resembling *gibbera* but with a slightly more anterior and pyramidal crest. Length female, 8.5 mm., width 4.5 mm., height 5 mm. Length male, 7 mm.

Pronotum long and acute, about five lateral carinae strongly developed back of the crest as in *woodruffi*; crest arising only slightly back of the metapodium, anterior margin slightly sloping from the metapodium to just before the evenly rounded apex; apex about one-half the width at base, posterior margin more sloping than the anterior, its outline almost straight to where it rounds on to the pronotum. Humeral angles very short and rounding, one-half the length of the eye. Male very small, hairy, with a low rounding crest sloping equally from both margins.

Color. Pale dirty grayish-brown with slight darkening of the margins of the humeral angles and crest; median carina black interrupted before and behind the crest with light. Male darker with the crest mottled brown.

Habitat. The writer took one female in the District of Columbia and has examined examples from Roselle Park, N. J. (Matausch, A. M. N. H.). In the pyramidal crest with the slightly projecting blunt apex, the female of this species superficially resembles *Palonica pyramidata*. The smaller size, blunt humeral angles, darker color and lack of the "step" will, however, readily separate this species.

15. *Telamona decorata* Ball. Plate IV, fig. 49.

Telamona decorata Ball, Proc. Bio. Soc. Wash. XVI, p. 179, 1903.

Telamona barbata Van Duzee, Bul. Buff. Soc. N. S. IX; p. 65, 1908.

Resembling *tiliae* but much smaller, smaller and with narrower crest than *reclivata*. Greenish-straw with a black crest. Length female, 8 mm., width 4.5 mm., height 4 mm.

Pronotum moderately long, lateral carinae rather weak, irregular, crest low, quadrangular, placed well back on pronotum, very slightly sloping on both anterior and posterior face, the dorsum convex. Male smaller with a more rounding crest and with the entire pronotum densely hirsute.

Color. Greenish-straw with the crest pitchy, sparsely flecked with white, a narrow oblique band and the apex of pronotum brown, the posterior face of crest broadly white and a small white spot on anterior base. Male with the ground color distinctly brownish.

Habitat. The writer has taken this species, both nymphs and adults, on oak in Iowa and Wisconsin. Most of these were from the black oak (*Q. velutina*) but one nymph was taken from white oak and one from burr oak at Ames, Ia. Examples have been

examined from Ames, Ia. (Knight), Arkansas (McElfresh), Kansas (Crevecoeur), Missouri (Uhl., U. S. N. M.), Illinois (God., U. S. N. M.) (Gerhardt), Pennsylvania (DeLong), New York (Van Duzee, Cornell), (Schaeffer, Brooklyn Mus.) (Davis), Connecticut (Woodruff), New Jersey (Dickerson, A. M. N. H.), Maryland (Uhl., U. S. N. M.). Van Duzee's New Mexico male was *gibbera* and his California examples from willow were no doubt *P. pyramidata* var. *portola* which has the dark crest. True *decorata* has not been taken west of the plains.

This is a small compact and quite distinct species easily separated by its pitchy, almost quadrangular, crest and hirsute male. Funkhouser in his Cayuga List reported this species from basswood. On examination, however, most of his material proved to be highly colored males of *tiliae* (his *reclivata*) which frequently have the pitchy crest. He also reported *barbata* as a distinct species and credited it to oak and basswood, again confusing *tiliae* males. This species is undoubtedly confined to the oaks as food plants. In his Connecticut List Funkhouser quotes the writer as stating in correspondence that *barbata* was *not* an oak species. This statement was based on the common determination of *barbata* at that time and had reference to the species the writer has since described as *tremulata*.

16. *Telamona woodruffi* Ball. Plate IV, fig. 50.

Telamona woodruffi Ball, Jl. Wash. Acad. XV, p. 205, 1925.

Resembling *compacta* but with a slightly higher and more angular crest as in *reclivata* and less maculations. Length 8 mm., width 4 mm., height 5 mm.

Pronotum. Rather high, crest broader than high, slightly inclined posteriorly, dorsum long and straight, both angles rounding. Anterior margins sloping more than posterior and about in line with the humeral angles. Humeral angles roundingly right-angled, almost equaling the eye, much longer and more acute than in *compacta*. About five lateral carinae, quite definitely marked on the apical portion of the pronotum. Male with a smaller crest sloping into the metapodium anteriorly.

Color. Rich, red brown with occasional white flecks, much smaller and more obscure than in *compacta*. Carina interruptedly dark, posterior slope of crest light with dark margins. Male darker.

Habitat. The type material was taken at Elizabeth, N. J., by Matusch (A. M. N. H.).

17. *Telamona compacta* Ball. Plate IV, fig. 51.

Telamona compacta Ball, Proc. Bio. Soc. Wash., XVI, p. 180, 1903.

Smaller than *decorata* with a longer crest, red brown, maculate with white. Length female, 7.5 mm., width 4 mm., height 4 mm.

Pronotum low with a short blunt apex as seen from above, the lateral carinae irregular, obscure. Crest low, quadrangular, longer than high, set well back, sloping on both margins, slightly more anteriorly, inflated with a median depressed area. Humeral angles very short, obtusely rounding. Male with crest lower and sloping anteriorly.

Color. Testaceous, shiny, sparsely and irregularly mottled with white spots. White markings emphasized along the suture on metapodium, the anterior base of crest, the posterior face of crest, and in a transverse band posteriorly. The light markings at anterior and posterior base of crest may be definitely dark margined. Male darker.

Habitat. The writer has collected this species on the black oak in Iowa and Wisconsin and has examined examples from Arkansas (McElfresh), Minnesota (Minn.), Illinois (Uhl., U. S. N. M.).

The shiny red color of this species so exactly matches the color of the smaller twigs of the black oak where the adults normally rest that it is very difficult to detect them unless one can get a profile view.

18. *Telamona wescotti* Godg. Plate IV, fig. 52.

Telamona wescotti Godg., Cat. Memb. N. A., p. 415, 1894.

Telamona obsoleta Ball, Proc. Bio. Soc. Wash. 16: p. 178, fig. 2, 1903.

Telamona jugata Osb., Ia. Acad. Sci. I, Part 2. p. 128. pl. 28, 1891. (a Uhler mss. name).

A large, low, heavy set, black and white species with an extremely long low crest. Length female, 10 mm., width 5 mm., height 4 mm.

Pronotum extremely long and low, the metapodium almost wanting, about three well marked carinae on each side on the posterior half. Crest long, low, about three times longer than its height, anterior margin sloping into metapodium, posterior margin sloping or rounded, dorsal margin slightly concave. Humeral angles broad and obtuse, not equalling the eye. A pair of large black callosities on the upper margin of face.

Color. Creamy or white, more or less mottled with fuscous, a broad median dark stripe expanded in a diamond

shape on metapodium, sharply narrowed on reaching the anterior edge of crest, then obliquely widening to the margin of pronotum opposite the posterior end of crest. This stripe has a dark centered white spot in the diamond, another behind the crest, and often a smaller one between the two. Some examples are very light with distinct markings, while others are smoky with the markings obscure and the light spots wanting.

Habitat. The writer has taken this species, both nymphs and adults, on the burr oak in Iowa and Wisconsin and has examined examples from Kansas (DeLong), Missouri (U. S. N. M.), Minnesota (K. U.), Illinois (Godg., U. S. N. M.), Ohio (Osborn), New York (Cornell and N. Y. S.), Long Island (Davis), Massachusetts and New Hampshire (Uhl., U. S. N. M.), North Carolina (Osborn), Dallas, Tex. (Schwarz and Barber, U. S. N. M.).

This is a strikingly distinct species with no close affinities in this genus. Superficially it closely resembles *Heliria molaris* and at first the writer placed that species in *Telamona* next to *wescotti*, but the nymphs of *molaris* with their anterior projections and large abdominal spines are typical of *Heliria*, while the nymphs of this species are of the simplest *Telamona* pattern. The writer has studied the type in the Goding collection and also the one in Prof. Wescott's collection. Funkhouser in the Biol. Memb. discussed and figured this species as *obsoleta* Ball while his *wescotti* was *Heliria molaris*.

19. *Telamona salvini* Dist. Plate IV, fig. 53.

Telamona salvini Distant, Ent. Month. Mag. 16, p. 11, 1879.

Telamona subfalcata Van Duzee, Bull. Buff. Soc. N. S. X; p. 509, 1912.

Resembling *reclivata* Fh. in general form but much larger and with a long crest acutely produced posteriorly. Length of female, 10 mm., width 5 mm., height 5 mm.

Pronotum long, low, and with an extremely long acute apex. Crest twice as long as high, sloping uniformly from the middle of the metapodium to the obtuse anterior angle. Dorsum long, level, or slightly sinuate, posterior angle produced acute, the posterior margin upright. Humeral angles very broad, about right-angled, the anterior margin rounding. The anterior base and a round spot two-thirds of the way to the posterior base deeply compressed.

Color. Pale greenish yellow, fading to sulphur yellow, irregularly mottled or inscribed with dark lines which are

almost regularly spaced along the margin of the pronotum. A broad, black median line on each humeral angle.

Habitat. Examples have been examined from several places in Florida, Black Mountains, N. C., Beutenmuller (A. M. N. H.), St. Simeon's Island (Bradley, Cornell), a single male from Madison, N. J. (A. M. N. H.), and a large female from Chichavac, Guatemala, 8600 ft., August (Slevin, Calif. Acad. Sci.), through Van Duzee.

This is a strikingly distinct species easily recognized by the long, acutely angled crest. It is apparently confined to the eastern seaboard, from New Jersey south to Florida and Guatemala. The Florida examples are not as acutely angled and lack most of the dark mottling. Two of them were taken in a trap light in a hammock by Mr. W. E. Stone. No definite food plant record is available, but by elimination it is probably the sweet gum (*Liquidambar*) as that is the only tree that grows in the Florida hammocks and extends up the coast to New Jersey. Matausch records taking two species of nymphs from this tree in New Jersey and rearing two species of *Telamona*. One he recorded as "near *Heliria*", (See *H. mexicana*), the other was probably this species.

20. *Telamona reclinata* Fitch. Plate IV, fig. 54.

Telamona reclinata Fh., Homop. N. Y. St. Cab., p. 51, 1851.

Telamona modesta Godg., Cat. Memb. p. 420, 1894.

Telamonanthe modesta of Bak., V. D. Cat. and Funk. Cat.

Not *Telamona reclinata* of authors (See *tiliae* Ball).

Smaller and less angular than *salvini*. Resembling *tiliae* and *decorata* but with the crest rounding to metapodium. Length ♀, 8 mm., width 4 mm., height 4 mm.

Pronotum long, low. Crest long, rather low, about half longer than high, the posterior margin upright, the anterior margin rounding to the metapodium, dorsum slightly rounding. Anterior base of crest compressed. Humeral angles broad, obtusely rounding, shorter than the eye. Male much smaller, densely hirsute, the crest very low and with an almost uniform oval outline.

Color. Dirty straw, with a greenish cast especially on the metapodium and more or less of smoky mottling. The crest pale brown, darkening along the dorsal line and with a definite oblique stripe expanding towards the margin. Male, less definitely marked.

Habitat. The writer has collected adults of this species commonly on burr oak and occasionally on black and white oaks in

Iowa and Wisconsin and has examined examples from Onaga and Manhattan, Kansas; Kansas City, Mo. (K. U.); Minnesota (Bak., U. S. N. M.); Illinois (Godg., U. S. N. M.); Michigan (U. S. N. M.); Indiana (Uhl., U. S. N. M.); New York (Fitch, Albany) (Woodruff); Long Island (Davis) (Olson); Pennsylvania (DeLong); New Jersey (A. M. N. H.); Maryland (Uhler, U. S. N. M.); North Carolina (Schaeffer, Brook, M.); Texas (Bishopp) (U. S. N. M.) (Calif. references refer to next species).

This is a small species superficially resembling *tiliae* and *decorata* but quite distinct in the sloping anterior margin of the crest in the female and the low oval crest of the male. This is not the species that has been listed as *reclivata* by all authors since Fitch, as explained under *tiliae*. A study of the Fitch type and description, however, leave no room for doubt that this was the species under consideration. Goding, accepting the erroneous determination of *reclivata*, described this species as *modesta*, a study of the type shows. Baker later erroneously referred this species to the genus *Telamonanthe*. Like all the species of *Telamonini* an occasional specimen will show a petiolate cell in the under wing but in all its characters it is a typical *Telamona*.

21. *Telamona vestita* Ball. Plate IV, fig. 55.

Telamona vestita Ball. J1. Wash. Acad. Sci. XV: p. 205. 1925.

Resembling *monticola*, slightly smaller, darker, and with the crest rounding over from the metapodium almost to the posterior angle. Length female, 9 mm., width 5 mm., height 6 mm. Length male 8 mm.

Pronotum rather broad and short, crest very broad, occupying nearly one-half the pronotum, anterior margins arising as a continuation of the curve of the metapodium and rounding over to the elongate dorsum; posterior margin short, upright, the angle often slightly acute. Anterior base of crest inflated. Humeral angles more prominent than in *monticola* and roundly right-angled, equalling the eye.

Color. Pale, dirty yellowish, slightly flecked with brown, often definite brown margins to crest and an oblique band to costa, a light area on the posterior face of crest. The males are much smaller and darker and the Oregon female is dark.

Habitat. The writer has collected this species on an undetermined oak in a number of places in the mountains of California, from Tehachapi north to Quincy, and has examined other examples

from similar situation in California from San Bernardino north (Van Duzee, C. A. S. Coll.), Gold Hill, Oregon (U. S. N. M.), and Colostin, Oreg. (Van Duzee). This is a very distinct species, superficially resembling *monticola* but lacking the green color and the white irrorations. It is close to *reclivata* in structure but has a higher and more rounding crest. Three males sent by Van Duzee show the light band running up into the crest as in *gibbera*. It is apparently confined to the west coast region. Reference to *reclivata* from California refer to this species.

Telamona vestita var. *carynotana* nov. var. Plate IV, fig. 56.

Resembling *vestita* but with the female broader and much inflated; a uniform convexity from the metapodium to top of crest. Posterior angle rounding, posterior face slightly sloping, humeral angles slightly acute, male still broader and more inflated with a low crest almost as broad and as low as in *Carynota mera*.

Color. Female uniform brown with the face and triangular metapodium very pale, a broad white stripe on posterior face of crest.

Holotype ♀, Forest Home, San Bernardino Co., California, June 13, 1928. (Van Dyke); allotype ♂, Potwisha, Calif., June 13, 1929 (Van Dyke). Type in collection of California Academy of Science. Allotype in author's collection. This may prove to be a distinct species when sufficient material is available to determine its limits of variation. The male of this variety together with the males of *reclivata* form a transition from the crests of *Telamona* to the broadly convex type of pronotum found in *Carynota*.

8. Genus *Carynota* Fitch.

Carynota Fitch *Hom. N. Y. State Cab. p. 48. 1851.*

Medium sized compact dark or brown species with the dorsum rounding over without a compressed crest. Pronotum as seen from the front resembling a truncated cone with the top rounded over; as seen from the side the hump ends beyond the middle of the pronotum in a sudden declivity. Lateral angles broad and obtuse except in *maculata* where they approach a right angle.

Type of the genus *Membracis mera* Say.

The four species of this genus form a compact and easily recognizable group. The nymphs are broad and flat and resemble the color of the bark of the twigs. There is a single generation. The nymphs appear in June the adults in July and August in the latitude of New York and Iowa.

KEY TO THE SPECIES OF *Carynota* (FEMALES)

- A. Dorsal crest relatively high, and joining the curve of the metapodium.
 - B. Obscure greenish gray with an oblique black band just before the apex of hump. 1. *mera* Say
 - BB. Rich testaceous with creamy markings ... 2. *marmorata* Say
- AA. Dorsal crest relatively long and low, placed well back with a definite sinuation behind the metapodium.
 - C. Rich testaceous slightly mottled with cream (Northeastern) 3. *stupidia* Walk.
 - CC. Piceous or black with white dots or spots (extreme Southeastern) 4. *maculata* Funk.

1. *Carynota mera* Say. Plate IV, fig. 57.

Membracis mera Say, Jl. Acad. Nat. Sci. Phil. V. p. 310, 1831.

Darnis tripartita Walker, List Homop. B. M. p. 576. 1851.

Gargara majus Emmons, N. Y. Agr. Rep. 5, p. 156, p. 13, fig. 6, 1854

Carynota strombergi Godg., Cat. Memb. N. A. p. 443, 1894 (♂).

Large, greenish gray with an oblique black band. Length ♀, 9–10 mm., width 5 mm. Male smaller.

Pronotum with a long uniform rather high hump curving into the metapodium in front and dropping away rapidly posteriorly.

Color. Almost uniform greenish gray, with a narrow slightly oblique band from just before the apex of crest down onto the elytra. Just back of this is a pale band set off by the brown apex of pronotum and smoky apex of elytra. Males are much smaller, darker, with lower hump and are inclined to be hairy.

Habitat. The writer has taken this species both nymphs and adults on the hickory, black walnut and butternut in Iowa, Wisconsin and Ontario and has examined examples from Connecticut, Massachusetts (A. M. N. H.), New Jersey (Barber), New York (Cornell), Pennsylvania (DeLong), Maryland (Minn), West Virginia and Georgia (Davis), North Carolina and Ohio (Ohio), Illinois (Ill.), Nebraska (Neb.), Kansas (DeLong).

2. *Carynota marmorata* Say. Plate IV, fig. 58.

Membracis marmorata Say, Journ. Acad. Nat. Sc. Phila VI. p. 301. 1831.

Thelia porphyrea Fairmaire, Rev. Memb. 306. 1846.

Carynota picta Prov., Pet. Fauna Can. III, p. 246. 1886.

Rich testaceous with creamy mottling. Short compact with a high uniform curve. Length ♀, 8 mm., width 4 mm. Males smaller. Shorter and more compact than *mera* with the hump high and uniform in curvature throughout. Apical portion of pronotum shorter.

Color. Rich testaceous irregularly mottled with creamy. Usually with numerous spots on the metapodium. A crescent on either side the hump, a white band back of the hump which often extends up the posterior face and may connect with a dorsal light line.

Habitat. The writer has collected this species on birch in July and August at Kilbourn, Wisconsin, and in the District of Columbia and has examined examples from New Hampshire, Vermont and Massachusetts (A. M. N. H.) New York (Albany), New Jersey (Barber), Pennsylvania (DeLong), Virginia and North Carolina (A. N. S.), Michigan (Gerhardt) and Minnesota (Minn.). The writer has not been able to find a single character by which *marmorata* Say and *porphyrea* Fairmaire can be separated. In fact it is apparent that there is but one variably colored species which Say described as "marbled" and Fairmaire without knowledge of a Say's species described as semi-circularly marked on either side.

3. *Carynota stupida* Walk. Plate IV, fig. 59.

Darnis stupida Walk., List Homop. B. M. 577. 1851.

Carynota muskokensis Goding, Cat. Memb. N. A. p. 444. 1894.

Carynota vera Goding, Can. Ent. p. 276, vol. 27. 1895

Carynota albopicta Buckton, Monog. Memb. p. 135, pl. 29, fig. 1. 1903.

Testaceous with few markings. Hump long, low, sloping to the long apex. Length ♀, 8-9 mm.

Longer and slenderer than *marmorata* almost as long as *mera* but with the hump low and placed well back from which it slopes uniformly to the long slender apex.

Color. Testaceous with irregular mottlings on the metapodium omitting the dark median carina, usually a triangular spot in the middle of the lower margin on either side and often scattered round dots on the posterior half sometimes coalescing into a median line on the posterior face of hump. Males are frequently nearly black.

Habitat. Osborn (1922) has given a good account of the life history of this species with figures of the stages. It was found only on yellow birch at Cranberry Lake, New York, the adults in July and August. Other examples have been examined from New

Hampshire (N. Hamp.), Massachusetts (A. M. N. H.), Connecticut, New York (Olson). *Vera* was described from Maine and *muskokensis* from Ontario.

4. *Carynota maculata* Funk. Plate IV, fig. 60.

Carynota maculata Funk., Ent. News 26: p. 98, pl. 3, fig. 3-4, 1915.

Smaller and more depressed than even *stipida*. Black shining with irregular white maculations. Length ♀, 7 mm., width 3 mm., height of crest 2 mm.

Metapodium almost wanting. The pronotum sloping back at a definite angle from the face and forming a slight convexity between the lateral angles, behind this there is a slight but definite sinus, before the low tumid and only slightly rounding hump that occupies less than one-half the pronotum. Apex of pronotum intermediate between *mar-morata* and *stipida*. Face tumid, irregular.

Color. Black shining, irregularly maculate with white dots or spots.

Habitat. The writer beat a female from a large leafed oak at Ocala, Florida, April 29. Mr. W. E. Stone beat another from a willow oak at Orange City, Florida, while Funkhouser described it from specimens from Jacksonville and Gainesville, Florida, taken in April.

9. Genus *Tropidarnis* Fowler.

Tropidarnis Fowler, Biol. C. A., Homop. p. 60, 1895.

Resembling an *Atymna* but lacking the petiolate cell in the underwing. Elongate with a low but slightly angularly rounding crest covering the entire pronotum.

Pronotum long and slender as viewed from above, tapering uniformly from the lateral angles. Crest low not foliaceous, extending from the posteriorly rounding metapodium to the apex. Highest before the middle.

Type of the genus *T. tectigera* Fowler.

Fowler placed this genus in the Darninae but his artist showed the petiolate apical cell that would place it in the *Smiliinae* where it undoubtedly belongs. The nymphs resemble those of *Telamona* except that the dorsal hump is higher and more like *Archasia*.

1. *Tropidarnis tectigera* Fowl. Plate IV, fig. 61.

Tropidarnis tectigera Fowl., Biol. C. A., Homop. p. 60, pl. 5, fig. 7, 1895.

Tropidarnis acutior Fowl., Biol. C. A., Homop. p. 61, 1895.

Tropidarnis pellicolor Buckton, Mogr. Memb. p. 114, pl. 24, fig. 4, 1903.

Tropidarnis robustus Buckton, Monog. Memb. p. 114, pl. 24, fig. 5, 1903.

Characters of the genus; crest very variable in height and shape; green with a dark line on the margin of the lateral angles. Length ♀, 9 mm., ♂ 7 mm.; width 4.5 mm., crest 3 mm.

Habitat. Described from Amula in Guerrero, Mexico, 6000 feet. The writer has taken nymphs and adults from *Quercus emoryi* in the Santa Rita Mts., Arizona, in May and adults later in the season from oaks.

This is one of the most variable of the treehoppers in size and height of crest and somewhat so in color. Fowler gave no character by which his two species could be separated except the shape of crest and both fall within the normal range of variation as does Buckton's *robustus*. *T. pellicolor* of Buckton is given as 15 mm. long which is longer than any examples examined but, as it has no other distinguishing characters and no habitat, it is included in the synonymy.

10. Genus *Archasia* Stål.

Archasia Stal. Bid Hemip. Syst. p. 556, 1867.

Large compressed, leaf-like, green species, with highly arched crests. Quite distinct in this sub-family but resembling *Membracis* and *Smilia* in outline. Crests higher and more foliaceous than in *Tropidarnis*.

Pronotum narrow and extremely high and foliaceous throughout, metapodium obscure, the elevated carina of the crest reaching almost to the base. Lateral angles of moderate size rounding or only right angled.

Type of the genus *Membracis galeata* Fabr.

The three known species are all oak feeders and two at least live on a number of species of oak. There is a single generation in Iowa, and southern Wisconsin. The nymphs appear in May and June and the adults in June and July. The nymphs of *belfragei* are elongate smooth reddish brown forms with a semi-circular protuberance extending upwards and forwards.

KEY TO THE SPECIES OF *Archasia* (FEMALES)

- A. Dorsal crest overhanging in front, extremely high and foliaceous, without a dark line on margin.1. *galeata* Fab.
 AA. Dorsal crest not overhanging in front, not so high, with a fine dark line throughout.
 B. Crest vertical in front, where it is highest, broadly oval as seen from side.2. *belfragei* Stål.

BB. Crest somewhat pyramidal in side view. Slightly sloping in front and more so posteriorly. 3. *pallida* Fairm.

1. *Archasia galeata* Fabr. Plate IV, fig. 62.

Membracis galeata Fabr., Syst. Rhyng. IV. 9, fig. 13, 1803.

Smilia auriculata Fitch, Cat. Hom. N. Y. p. 49, 1851.

Large, green, unmarked, the entire pronotum covered by a high almost uniformly rounding overhanging crest. Length ♀, 9 mm., height of crest 6 mm., width 5 mm. Male smaller.

Crest definitely overhanging the metapodium and extending to the apex of pronotum in a single curve in the female, slightly narrower in the male. Lateral angles broad, rounding.

Color. Bright green (in life) without marking except a faint smoky mottling in the carina and at the apex of elytra. Examples from the south may have a narrow line on the carina.

Habitat. The writer has collected this species in small numbers from oak in Iowa, Wisconsin, Massachusetts, District of Columbia and Florida and has examined examples from Colorado (Acad. N. S.), Arkansas (McElfresh), Kansas (DeLong), Nebraska (Crawford), Minnesota (Acad. N. S.), Ohio (Osborne), Pennsylvania (DeLong), New York (Olson), Connecticut (Ames). They are found most abundantly on cut over areas where the second growth is rank. The Florida males have a definite dark line on the carina and resemble females of *belfragei*.

2. *Archasia belfragei* Stål. Plate IV, fig. 63.

Archasia belfragei Stål, Bid. Memb. Kan. p. 250, 1869.

Archasia canadensis Prov., Pet. Faun. Can. III, p. 230, 1886.

Resembling *galeata* but crest smaller, darker with the front upright. Length ♀, 9 mm. Crest height 4.5 mm. Male smaller.

Crest vertical in front, not as high as in *galeata*, sloping posteriorly, with a sinuation before the acute apex of pronotum. Lateral angles right angled.

Color. Green with a slightly smoky cast, emphasized on a line on carina and a dusky spot at apex of elytra.

Habitat. The writer has taken this species in great abundance both larvae and adults on various oaks in Iowa and Wisconsin and has collected examples in Vermont and Ontario, examples have been examined from Arkansas (McElfresh), Kansas (DeLong), Ohio and Pennsylvania (DeLong), New York (Fitch).

3. *Archasia pallida* Fairm. Plate IV, fig. 64.

Thelia pallida Fairm., Rev. Memb. 308, 1846.

Thelia conica Walk., List Homop. B. M. 557, 1851.

Resembling *belfragei* but with a slightly lower crest that narrows from both front and rear. Length ♀, 9 mm., crest 4.5 mm., high. Male smaller. Crest sloping slightly back from metapodium, then broadly rounding above with the anterior portion highest, the posterior slope more acute than the anterior, then abruptly changing into the relatively long and acute apex of pronotum. Lateral angles rounding.

Color. Pale green with a heavy dark line along the carina.

Habitat. The writer with W. E. Stone collected male, female and large nymphs of this rare species from oaks at Sanford, Florida, April 9, 1927. Examples have been examined from Roselle Park, N. J., June 21 and July, 1911 (Matausch Coll. A. M. N. H.), a female, Wooster, Ohio, 8-7-20 (Osborn coll.), and another, St. Vincent, Pa. (Wirtner).

This species has apparently never been recognized since the original description in 1846. Walker (as usual) redescribed it as *conica* from Florida and his species has not been recognized. Funkhouser described and figured a species which he recognized as *conica* in discussing the Walker types but placed it in *Telamona*. What he had is not known, but it could not have been this species as it had dark markings not described by Walker and he would not have placed it in that genus. Funkhouser in his Cat. of Memb. p. 236 gives Arizona as a habitat for this species. No doubt a misidentification of *Atymna simplex*, a common species in Arizona which is similar in general outline, but belongs in a different sub-family.

SPECIES INCORRECTLY LISTED

THELIA LUTIPES Emmons = *Campylenchia latipes* Say

Thelia lutipes Emmons, Agr. N. Y., V. p. 156, pl. 13, fig. 18, 1854.

Thelia lutipes Funkhouser, Cat. Membr. p. 266, 1927.

This was merely a typographical error on page 156 of Emmons as he figures *latipes* and spells it correctly on the explanation of the plate. It was however Plate 13 and not 3, as cited, which is no doubt what misled Funkhouser and led him to insert this in his catalogue as a *Thelia*.

GLOSSONOTUS GIBBOSA Funk = a *Darninae*.

Funkhouser (Cat. p. 241) lists *Hemyptycha gibbosa* Walk. from Brazil as a *Glossonotus* and in error gives Butler as authority.

Butler referred *acuminatus* to *Glossonotus* and *gibbosa* to *Telamona*? Walker was undoubtedly right in referring this species to the *Darninae*.

HELIRIA PULCHRA Godg. = *Telamonanthe rileyi* Godg.

Telamona mexicana Stål? or *pulchra* Goding, Ent. News 3, p. 109, 1892.

The type of this species was not found in the National Museum Collection. Goding very briefly described it and later states "I believe this to be the ♂ of *mexicana*; if it should prove to be undescribed it may be called *pulchra*." It was described from a single male from Dr. Riley for which he gives the habitat "California"? Goding omits this reference and name in his catalogue although he includes *T. rileyi*, which preceded it but he does give the habitat "California (Goding)" under *mexicana*. Van Duzee gives *pulchra* in parenthesis under this reference to *mexicana* in his catalogue but omits it from his species list. Funkhouser omits it entirely from his catalogue but gives the "California"? habitat of *mexicana* crediting it to Van Duzee.

If *mexicana* is limited to the sweet gum it certainly does not occur in California and Goding's single structural item in the description "dorsal crest nearly thrice as long as high at base" would suggest that he had a specimen of *Telamonanthe rileyi* under consideration probably a parasitized female that he mistook for a male. This is also suggested by the description following that of *rileyi*.

HELIRIA ANOFLAVA Buckton = *Atypa gibba* La Porte (a *Darninae*).

Heliria anoflava Buckton, Mon. Memb., p. 198, pl. 43, fig. 4, 1903.

This is a characteristic example of Buckton's methods. He described this insect as a *Heliria* when his own figure of the venation (fig. 4a) shows conclusively that it cannot belong to that genus or even to the sub-family *Smilinae* but is according to Funkhouser a *Darninae* of a well known South American genus and not an inhabitant of North America at all. It was not a n. sp., not a *Heliria* not even that sub-family and not from North America; otherwise Buckton's treatment was fairly accurate.

TELAMONA RUFICARINATA Fowl., Trans. Ent. Soc. London, p. 421, 1894.

Telamona gibba Buckton, Mong. Memb., p. 197, pl. 43, fig. 2, 1903.

Funkhouser places Buckton's species as identical with Fowler's which from the description seems to be correct. Mr. W. E. China of the British Museum kindly examined the Buckton type and reports that there is no long spine-like structure on the pronotum as shown but that it was due to the elytron overlapping on the apical part. China's drawing of the venation of the elytra shows the apical cell with the base truncate which would exclude this species from the sub-family *Smiliinae*. From the outline of the pronotum it appears to be another of the double-humped *Darninae* from the Bogotá region.

TELAMONA SPINIGER Haviland, Zoologica 6, p. 257, pl. 3, fig. 3, 1925.

This species from British Guiana cannot be a *Telamona* on account of the long spine, and if her description is correct cannot be a *Telamonini* as she says "Tegmina entirely free," which would place it in the tribe *Cerasini* if it belongs to the sub-family *Smiliinae*. China sent drawings of both elytra of the type as they differ somewhat in venation but neither one has any suggestion of a petiolate apical cell so it cannot belong to the *Smiliinae* and will probably be found to belong to the *Darninae* along with the other South American forms.

HELIRIA GOUNELLEI Fallou, Rev. Ent. 9, p. 353, 1891.

TELAMONA GOUNELLEI Fallou, Rev. Ent. 9, p. 354, 1891.

The writer has not seen the descriptions of these two species from Brazil but they probably belong with those above rather than in the *Telamonini*.